CDM Smith

March 12, 2021

Ms. Deborah Sharpless
Chief Financial Officer
Maryland Transportation Authority
2310 Broening Highway
Suite 150
Baltimore, MD 21224

Subject: CONFIDENTIAL, PRE-DECISIONAL, DELIBERATIVE FINAL I-495 and I-270 P3
            Program Preliminary Toll Rate Due Diligence Report

Dear Ms. Sharpless:

Maryland law requires the establishment of a toll rate range for variably priced facilities, including those utilizing dynamic pricing such as for the I-495 and I-270 Priced Managed Lane P3 Program. CDM Smith has provided support toward developing a preliminary toll rate range for the P3 Program through traffic and revenue (T&R) models and post-model analysis. This letter report summarizes CDM Smith's analytical support for the preliminary toll rates to date. Some overarching notes related to the analysis are provided below:

Geographic Applicability of the Preliminary Toll Rates: The results and analysis included in this report are for the Alternative 9 configuration of Phase 1 South of the P3 Program, between the George Washington Memorial Parkway and I-495 Interchange near the Maryland-Virginia border and the I-370 and I-270 interchange. The Phase 1 South assumptions also include access to the I-495 north beltway west of the MD 187 and I-495 interchange and to the I-270 east spur. Based on review of T&R modeling results for the full I-495 and I-270 Managed Lane Study (MLS) Program, CDM Smith believes preliminary toll rate findings for Phase 1 South would also be sufficient for the other phases of the MLS P3 program as well, assuming the Alternative 9 configuration. Although alternative configurations are not yet developed for Phase 1 North on I-270 between the I-370 interchange and the I-70 interchange, it is also likely that the preliminary toll rates would be sufficient for many potential configurations for Phase 1 North.

Cross-Border Agreement: The tolling configurations and access assumptions near the Maryland-Virginia border on the northeastern I-495 Beltway are still being developed as part of the Maryland-Virginia Cross-Border Agreement. Different assumptions near the Maryland-Virginia border have been used by CDM Smith at different points in the preliminary toll rate range development process to reflect the evolving discussions related to the Cross-Border Agreement. When applicable, differences in assumptions are described in the sections of this report. CDM Smith believes that the preliminary toll rate range currently being discussed would be suitable for all the different assumptions related to the Cross-Border Agreement that have been discussed to this point.

P3 Developer Selection: CDM Smith has made reasonable assumptions related to the physical and operating characteristics related to T&R estimation. For example, these include the toll gantry locations for the project. These assumptions, including toll gantry locations, are subject to change during the project predevelopment phase after the developer is selected. The developer will perform their own T&R studies to support project financing.

COVID-19 Impacts: The unique COVID-19 situation impacting travel around the world, nation, and in Maryland, has the potential for both upside and downside risks related to medium and long-term travel. Thus, the potential for COVID-19 impacts on toll rates remains for the P3 Program. Given that the first phase of the P3 Program is likely to open for travel more than five years into the future and the continued uncertainty (both upside and downside), adjustments have not been made at this time to the T&R modeling and preliminary toll rate analysis process to account for COVID-19. It is believed that this is a reasonable approach given current industry discussion, outlooks in the financial and forecasting community, and feedback received from the potential bidders.

The sections of this report are listed below:

1. Axle and Payment Type Factors: This section describes the axle and payment type factors that are assumed in the preliminary toll rate setting process

2. Toll Rate Segments: This section describes and shows the assumed toll gantry locations for the preliminary toll rate analysis

3. Average Toll Rates: This section briefly describes CDM Smith's modeling process which was used to estimate average toll rates as well as providing tables and discussion with the estimated 2025 model year average toll rates

4. Toll Rate Distribution: This section describes the potential variability of toll rates compared to the average. Data from the Virginia I-495 Express Lanes was used to estimate potential variability of the toll rates

5. Maximum Toll Rates: This section describes the estimation process and results for the maximum toll rate used in the preliminary toll rates

6. Soft Rate Cap: This section describes analysis made to support the preliminary soft rate cap

7. Escalation Factors: This section describes the need for and analytical support for the preliminary escalation factors

8. Estimated 2021 Toll Rates: This section includes toll rates and soft rate cap analysis estimated for a 2021 model year.

1.Axle and Payment Type Factors

The preliminary toll rates for the P3 Program generally used the same more than 2-axle and payment type factors compared to passenger car (2-axle) vehicles as are currently approved for

existing MDTA facilities. There are a few exceptions, namely that mass transit and over the road buses will be provided free travel for the P3 program and that NEPA build alternatives that include HOV3+ free travel on the managed lanes also assume motorcycles would travel for free. The estimates in this report focus on 2-axle ETC toll rates with the understanding that vehicles with more than 2-axles and other payment types would use factors similar to those approved for existing MDTA facilities. The classifications and payment types include the "Toll Modernization" changes approved by MDTA in November 2019.

2.Toll Rate Segments

Toll segments for the project were assumed to be divided by each set of access/egress ramps to/from the priced managed lanes and by travel direction. Each toll segment was assumed to have a toll gantry to prevent free movements on the priced managed lanes. The toll rate within each toll segment was assumed to vary to maintain speeds of at least 45 miles per hour on the priced managed lanes. The exact physical location of the toll gantry within a toll segment was not made by CDM Smith for the T&R modeling because the exact location of a toll gantry within a toll segment does not impact the T&R modeling process. For the purposes of the preliminary toll rates, the toll rate range and soft cap were assumed to be applied on a toll segment by toll segment basis. **Figures 1, 2, and 3** on the next pages show the assumed configuration on Phase 1 South for the preliminary toll rate analysis.

Drivers deciding whether to travel in the priced managed lanes would typically see a variable message sign with toll rates to specific destinations near access ramps to the facility. The toll rates in the signs would include the summation of toll rates in one or more toll segments. Typically, the rates on the signs include the toll rate to the next exit ramp, an intermediate major destination, and for a longer distance trip. An example of potential toll rate signs is provided later in this report.

3.Average Toll Rates

A key input into the preliminary toll rate process was reviewing the average toll rate estimated by CDM Smith using the T&R model. This section briefly describes the modeling process and provides some average toll rate results for the project. Average toll rate results are provided for a 2025 model year. Estimated average toll rates for a 2021 model year are provided in Section 8 of this report.

3.1 Modeling Process

The T&R model used by CDM Smith for this study was originally based on the Metropolitan Washington Council of Governments (MWCOG) regional travel demand model but with updates and enhancements incorporated by CDM Smith for the P3 program. These include incorporating detailed corridor counts, speeds, and origin-destination data as part of a model calibration effort and cutting a model subarea for the project region to allow for more efficient model run time. Considering future years, independent socioeconomic forecasts for the region with a focus on the P3 program influence area as well as future transportation projects were incorporated. The tolling algorithm in the updated and enhanced CDM Smith project model was developed using the results of a stated preference survey conducted specifically for this project and experience in other priced managed lane studies.
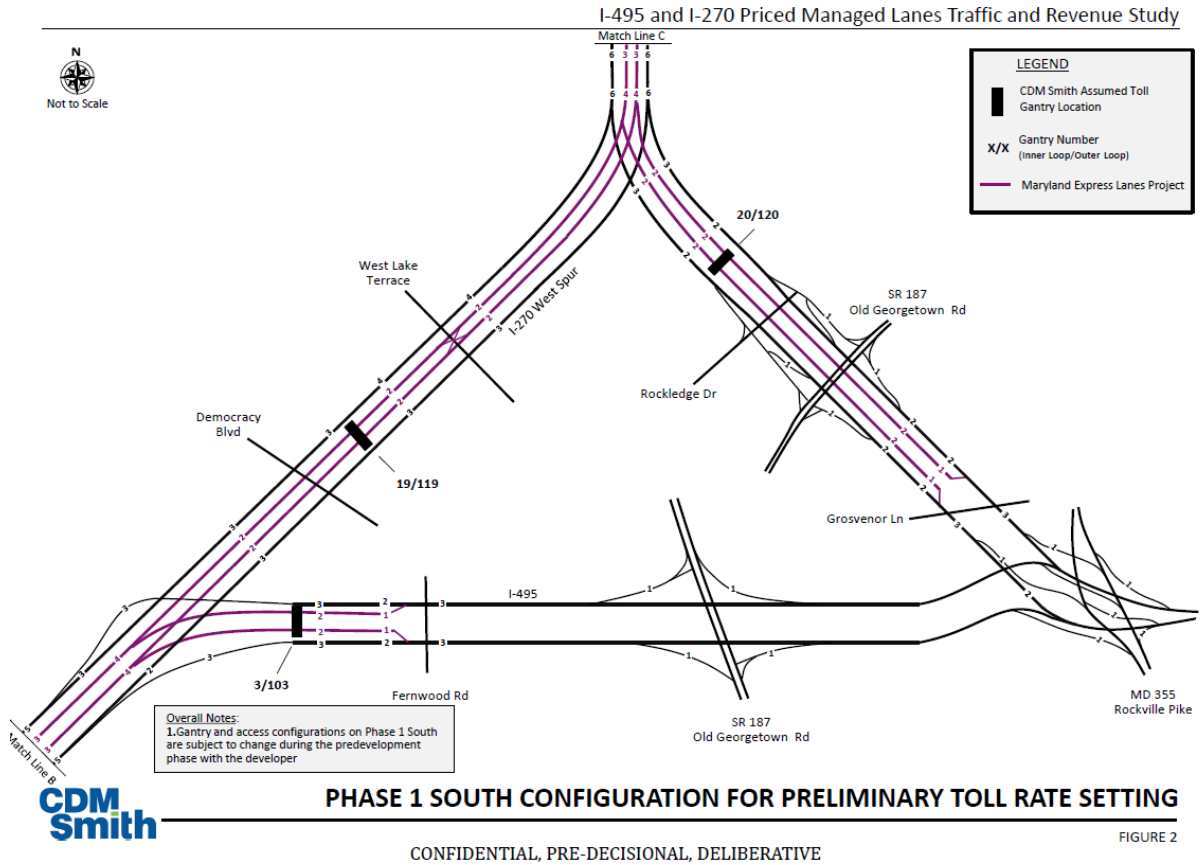
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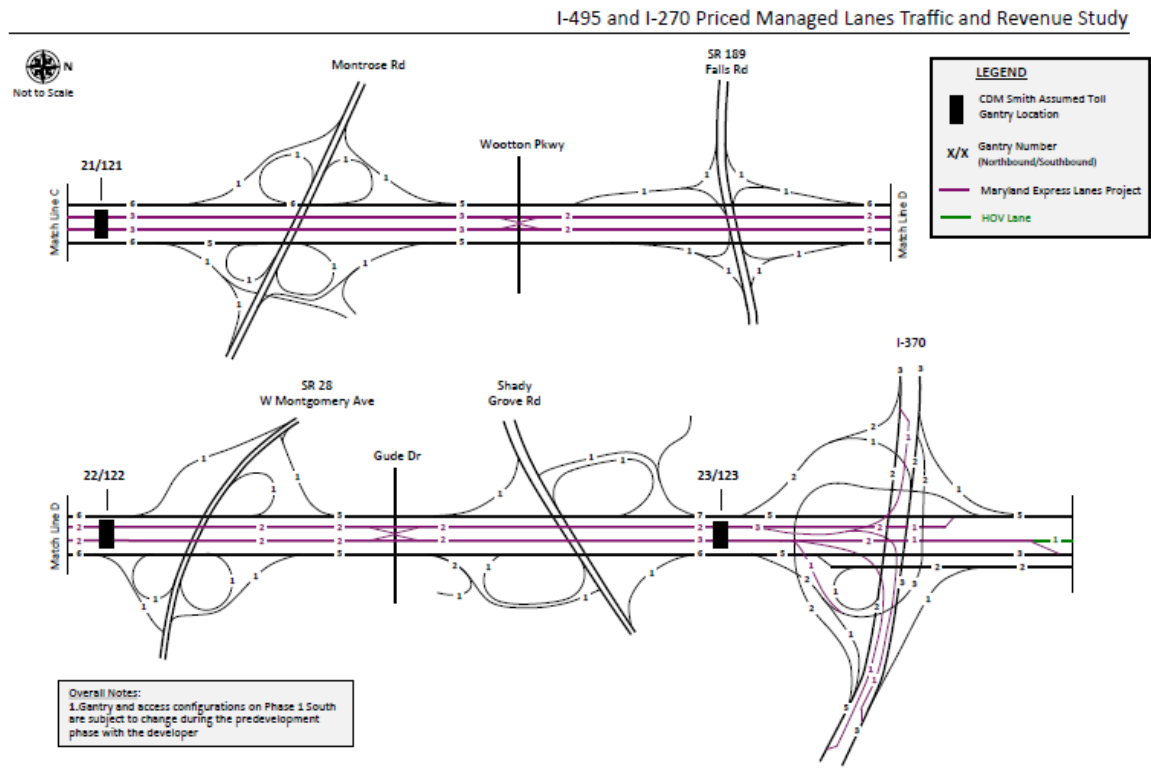PHASE 1 SOUTH CONFIGURATION FOR PRELIMINARY TOLL RATE SETTING

FIGURE 1

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PHASE 1 SOUTH CONFIGURATION FOR PRELIMINARY TOLL RATE SETTING

FIGURE 2

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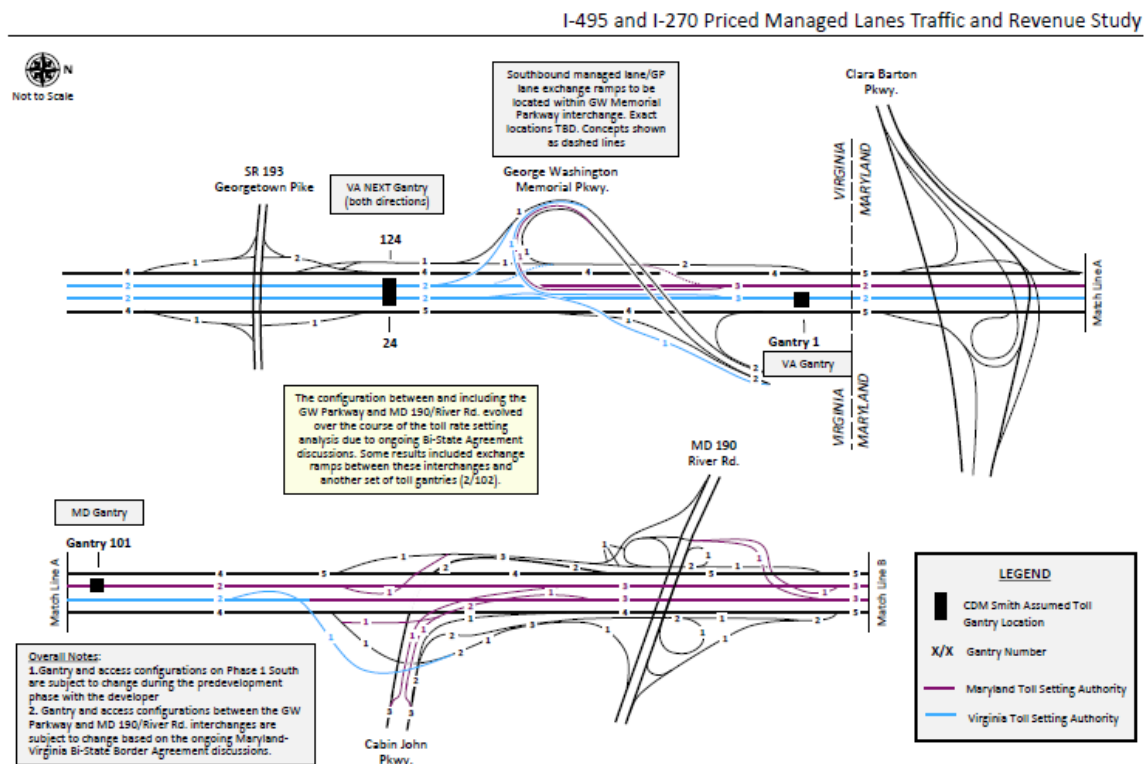
PHASE 1 SOUTH CONFIGURATION FOR PRELIMINARY TOLL RATE SETTING

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The I-495 beltway in Virginia was included in the model subarea region. This allowed the Virginia I-495 Express Lanes to be included in the model enhancement effort. Including this facility in the calibration process allowed testing and refining of the toll algorithm to actual priced managed lane utilization and revenue performance.

CDM Smith's average weekday project model included a base year of 2017, future years 2025, 2035, 2045, and 2060, and 13 time periods. Many assumptions were made by CDM Smith in collaboration with the project team as part of the T&R modeling, all of which were considered reasonable for this analysis. Two key assumptions for the preliminary toll rate analysis process were that the tolling objective taken by the developer was for revenue maximization using dynamic tolling and that the priced managed lane minimum speed threshold would be 45 miles per hour.

A wide range of typical toll rates were tested in CDM Smith's model to develop toll sensitivity curves and identify traffic and revenue at different toll rate levels. Toll sensitivity curves were developed by assigning different levels of per mile toll rates at all the toll rate gantries, running the model, and assembling toll transactions and revenue for each toll rate level, tolling location, analysis period, travel direction, and analysis year. Given the assumption of revenue maximization, a toll rate corresponding to a location near the top of the revenue curve for each gantry was selected. **Figure 4** shows an example set of toll sensitivity curves for the southbound AM peak direction for four toll gantries on the Phase 1 South project. As is typical on CDM Smith's priced managed lane T&R studies, the selected toll rate was slightly lower (to the left) of the estimated revenue maximization point to account for what can be very little variability in revenue at many different toll rates near the absolute maximization point and to reflect that this is a modeling exercise with some uncertainty to the exact revenue maximizing point.. It should also be noted that the figure shows rate curves when all gantries are tested at the same rate. The final toll rate selection is an iterative process given that rates at different gantries impact each other when they are varied to account for varying demand conditions in different toll segments.

3.2 Average Toll Rate Results

One of the key outputs of the modeling process with respect to the preliminary toll rates are the average toll rates by time period and gantry. **Table 1** includes the resulting average passenger car ETC per mile toll rates (in 2021$) for Phase 1 South and model year 2025. **Table 2** is similar but includes the total toll rates which are calculated as the per mile rates for each gantry times the gantry segment distance. Note that the model was run in 2019$. Inflation factors were applied to convert the results from 2019$ to 2021$. As shown, per mile toll rates are the highest during the PM peak on the I-495 Inner Loop. Note also that these results do not consider the impacts of the soft toll rate cap. These impacts and results are discussed later in this report.

The average toll rates can also be expressed in terms of average toll rates per trip, rather than average toll rates per gantry. **Table 3** includes these results by travel direction for the 2025 model year in 2021$. As shown, the daily average trip length is estimated to be just under seven miles with the daily average toll paid being about $5.00 in the northbound direction and about $4.00 in the southbound direction. This results in a daily average estimated average toll paid per mile of $0.76 in the northbound direction and $0.58 in the southbound direction.

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I-495 and I-270 Priced Managed Lanes Traffic and Revenue Study
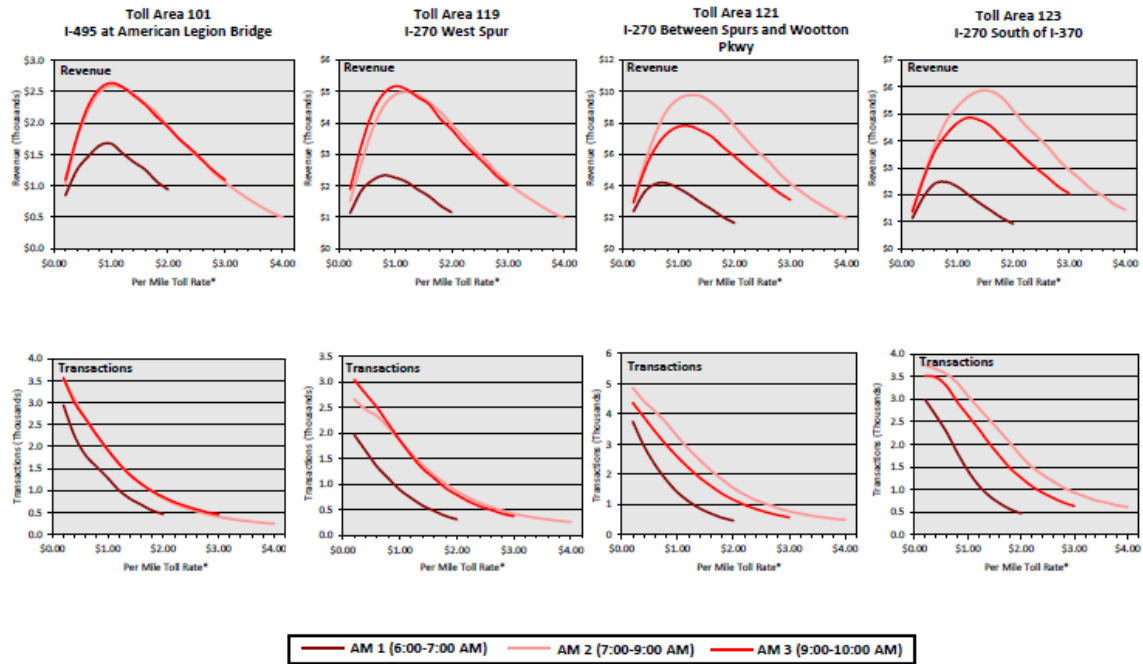
2025 TOLL SENSITIVITY ANALYSIS
SOUTHBOUND AM PEAK

FIGURE 4

Table 1 – 2025 Estimated Weekday Average Per Mile Toll Rates per Gantry in 2021$*
Passenger Car ETC, Phase 1 South
Without Soft Cap

Roadway	Toll Gantry	Dist. (miles)	5 AM	6 AM	7 & 8 AM	9 AM	10 AM & 11 AM	12 PM and 1 PM	2 PM	3 PM	4 & 5 PM	6 PM	7 PM	8 PM	12 PM to 4 AM
MD I-495 Inner Loop	1	1.4	$0.21	$0.77	$1.50	$0.88	$0.36	$0.36	$0.93	$1.19	$2.22	$2.32	$0.77	$0.21	$0.21
MD I-495 Outer Loop	101	1.4	$0.36	$0.83	$0.88	$0.83	$0.36	$0.36	$0.41	$0.98	$1.34	$0.98	$0.36	$0.21	$0.21
MD I-495 Inner Loop	2	1.2	$0.21	$0.98	$1.50	$0.83	$0.36	$0.36	$0.93	$1.19	$2.22	$2.32	$0.83	$0.21	$0.21
MD I-495 Outer Loop	102	1.2	$0.36	$0.77	$0.88	$0.83	$0.36	$0.36	$0.52	$0.98	$1.34	$0.98	$0.36	$0.21	$0.21
MD I-495 Inner Loop	3	3.2	$0.21	$0.77	$1.14	$0.72	$0.36	$0.36	$1.03	$1.14	$1.19	$2.27	$0.77	$0.21	$0.21
MD I-495 Outer Loop	103	3.2	$0.36	$0.52	$0.72	$0.72	$0.36	$0.36	$0.57	$0.98	$1.39	$0.93	$0.36	$0.21	$0.21
MD I-495 IL / I-270 W Spur NB	19	2.7	$0.21	$0.88	$0.88	$0.46	$0.31	$0.36	$0.72	$1.08	$1.96	$1.76	$0.62	$0.21	$0.21
MD I-495 OL / I-270 W Spur SB	119	2.7	$0.31	$0.72	$1.03	$0.88	$0.41	$0.36	$0.36	$0.67	$1.14	$0.88	$0.31	$0.21	$0.21
I-270 E Spur NB	20	1.9	$0.21	$0.21	$0.21	$0.21	$0.21	$0.21	$0.31	$0.41	$0.72	$0.88	$0.52	$0.21	$0.21
I-270 E Spur SB	120	1.9	$0.21	$0.52	$0.93	$0.88	$0.31	$0.21	$0.21	$0.21	$0.36	$0.21	$0.21	$0.21	$0.21
I-270 Northbound	21	3.0	$0.21	$0.36	$0.41	$0.36	$0.21	$0.31	$0.57	$0.88	$1.55	$1.50	$0.57	$0.21	$0.21
I-270 Southbound	121	3.0	$0.21	$0.62	$1.03	$0.93	$0.36	$0.36	$0.31	$0.41	$0.52	$0.57	$0.21	$0.21	$0.21
I-270 Northbound	22	2.8	$0.21	$0.21	$0.36	$0.36	$0.21	$0.36	$0.52	$0.77	$1.50	$1.50	$0.57	$0.21	$0.21
I-270 Southbound	122	2.8	$0.21	$0.67	$1.19	$1.08	$0.36	$0.36	$0.31	$0.36	$0.36	$0.46	$0.21	$0.21	$0.21
I-270 Northbound	23	1.8	$0.21	$0.21	$0.36	$0.36	$0.21	$0.36	$0.57	$0.88	$1.50	$1.60	$0.57	$0.21	$0.21
I-270 Southbound	123	1.8	$0.21	$0.67	$1.29	$1.14	$0.36	$0.36	$0.31	$0.31	$0.36	$0.36	$0.21	$0.21	$0.21
Full Length Northbound	1,2,19,21,22,23	**12.9**	**$0.21**	**$0.52**	**$0.71**	**$0.48**	**$0.26**	**$0.35**	**$0.66**	**$0.96**	**$1.75**	**$1.73**	**$0.63**	**$0.21**	**$0.21**
Full Length Southbound	101,102,119,121,122,123	**12.9**	**$0.26**	**$0.70**	**$1.07**	**$0.96**	**$0.37**	**$0.36**	**$0.35**	**$0.56**	**$0.76**	**$0.66**	**$0.26**	**$0.21**	**$0.21**

*The configuration between GW Parkway and River Rd/MD 190 (corresponding to Gantries 1/101 and 2/102 in this table) are under discussion with Virginia as part of the Capital Beltway Accord. All configurations on Phase 1 South are subject to change during the predevelopment phase with the developer

Table 2 – 2025 Estimated Weekday Average Toll Rates per Gantry in 2021$*
Passenger Car ETC, Phase 1 South
Without Soft Cap

Roadway	Toll Gantry	Dist. (miles)	5 AM	6 AM	7 & 8 AM	9 AM	10 AM & 11 AM	12 PM and 1 PM	2 PM	3 PM	4 & 5 PM	6 PM	7 PM	8 PM	12 PM to 4 AM
MD I-495 Inner Loop	1	1.4	$0.29	$1.08	$2.10	$1.23	$0.51	$0.51	$1.30	$1.66	$3.11	$3.25	$1.08	$0.29	$0.29
MD I-495 Outer Loop	101	1.4	$0.51	$1.16	$1.23	$1.16	$0.51	$0.51	$0.58	$1.37	$1.88	$1.37	$0.51	$0.29	$0.29
MD I-495 Inner Loop	2	1.2	$0.25	$1.18	$1.80	$0.99	$0.43	$0.43	$1.11	$1.42	$2.66	$2.79	$0.99	$0.25	$0.25
MD I-495 Outer Loop	102	1.2	$0.43	$0.93	$1.05	$0.99	$0.43	$0.43	$0.62	$1.18	$1.61	$1.18	$0.43	$0.25	$0.25
MD I-495 Inner Loop	3	3.2	$0.66	$2.48	$3.63	$2.31	$1.16	$1.16	$3.30	$3.63	$3.80	$7.27	$2.48	$0.66	$0.66
MD I-495 Outer Loop	103	3.2	$1.16	$1.65	$2.31	$2.31	$1.16	$1.16	$1.82	$3.14	$4.46	$2.97	$1.16	$0.66	$0.66
MD I-495 IL / I-270 W Spur NB	19	2.7	$0.56	$2.37	$2.37	$1.25	$0.84	$0.98	$1.95	$2.93	$5.30	$4.74	$1.67	$0.56	$0.56
MD I-495 OL / I-270 W Spur SB	119	2.7	$0.84	$1.95	$2.79	$2.37	$1.11	$0.98	$0.98	$1.81	$3.07	$2.37	$0.84	$0.56	$0.56
I-270 E Spur NB	20	1.9	$0.39	$0.39	$0.39	$0.39	$0.39	$0.39	$0.59	$0.78	$1.37	$1.67	$0.98	$0.39	$0.39
I-270 E Spur SB	120	1.9	$0.39	$0.98	$1.77	$1.67	$0.59	$0.39	$0.39	$0.39	$0.69	$0.39	$0.39	$0.39	$0.39
I-270 Northbound	21	3.0	$0.62	$1.08	$1.24	$1.08	$0.62	$0.93	$1.70	$2.63	$4.65	$4.49	$1.70	$0.62	$0.62
I-270 Southbound	121	3.0	$0.62	$1.86	$3.10	$2.79	$1.08	$1.08	$0.93	$1.24	$1.55	$1.70	$0.62	$0.62	$0.62
I-270 Northbound	22	2.8	$0.58	$0.58	$1.01	$1.01	$0.58	$1.01	$1.45	$2.17	$4.19	$4.19	$1.59	$0.58	$0.58
I-270 Southbound	122	2.8	$0.58	$1.88	$3.32	$3.04	$1.01	$1.01	$0.87	$1.01	$1.01	$1.30	$0.58	$0.58	$0.58
I-270 Northbound	23	1.8	$0.37	$0.37	$0.65	$0.65	$0.37	$0.65	$1.02	$1.58	$2.69	$2.88	$1.02	$0.37	$0.37
I-270 Southbound	123	1.8	$0.37	$1.21	$2.32	$2.04	$0.65	$0.65	$0.56	$0.56	$0.65	$0.65	$0.37	$0.37	$0.37
Full Length Northbound	**1,2,19,21,22,23**	**12.9**	**$2.66**	**$6.66**	**$9.16**	**$6.22**	**$3.34**	**$4.51**	**$8.54**	**$12.39**	**$22.60**	**$22.34**	**$8.06**	**$2.66**	**$2.66**
Full Length Southbound	**101,102,119,121,122,123**	**12.9**	**$3.34**	**$8.98**	**$13.81**	**$12.38**	**$4.80**	**$4.66**	**$4.53**	**$7.17**	**$9.77**	**$8.57**	**$3.34**	**$2.66**	**$2.66**

*The configuration between GW Parkway and River Rd/MD 190 (corresponding to Gantries 1/101 and 2/102 in this table) are under discussion with Virginia as part of the Capital Beltway Accord. All configurations on Phase 1 South are subject to change during the predevelopment phase with the developer

Table 3 – 2025 Estimated Weekday Average Toll Rates Per Trip in 2021$*
Passenger Car ETC, Phase 1 South
Without Soft Cap

Direction	5 AM	6 AM	7 & 8 AM	9 AM	10 AM & 11 AM	12 PM and 1 PM	2 PM	3 PM	4 & 5 PM	6 PM	7 PM	8 PM	12 PM to 4 AM	Daily
Average Toll Paid Per Mile (2021$)														
Northbound	$0.21	$0.58	$0.75	$0.49	$0.24	$0.31	$0.64	$0.89	$1.56	$1.60	$0.58	$0.21	$0.21	$0.76
Southbound	$0.24	$0.60	$0.95	$0.86	$0.34	$0.33	$0.35	$0.59	$0.81	$0.69	$0.25	$0.21	$0.21	$0.58
Average Toll Paid (2021$)														
Northbound	$1.15	$3.48	$4.31	$2.85	$1.62	$2.10	$4.16	$6.05	$10.96	$11.75	$4.10	$1.26	$0.50	$5.02
Southbound	$2.04	$4.44	$6.78	$5.86	$2.42	$2.16	$2.15	$3.73	$5.29	$4.54	$1.73	$1.03	$0.73	$3.99
Average Trip Length														
Northbound	5.57	6.00	5.76	5.79	6.75	6.68	6.51	6.81	7.03	7.34	7.10	6.12	2.42	6.63
Southbound	8.43	7.41	7.15	6.82	7.18	6.63	6.13	6.28	6.55	6.61	7.02	4.97	3.52	6.86

*The configuration between GW Parkway and River Rd/MD 190 (corresponding to Gantries 1/101 and 2/102 in this table) are under discussion with Virginia as part of the Capital Beltway Accord. All configurations on Phase 1 South are subject to change during the predevelopment phase with the developer

3.3 Example Average Toll Rate Results to Specific Destinations

As discussed previously, drivers determining whether to travel in the priced managed lanes would typically see a variable message sign with toll rates to specific destinations near access ramps to the facility. The toll rates in the signs would include the summation of toll rates in one or more toll segments. Typically, the rates on the signs include the toll rate to the next exit ramp, an intermediate major destination, and for a longer distance trip. Two examples of how the toll rates may look to drivers are provided in **Figure 5**.

4.Toll Rate Distribution

The dynamic toll rates charged on the I-495 and I-270 priced managed lanes are expected to fluctuate due to several different factors, including:

1. Long-term factors (due to corridor traffic growth and changes in willingness to pay over time)

2. Month-to-month factors (seasonality)

3. Day-to-day factors (different days of the week)

4. Hour-to-hour factors (times of day, peak vs off-peak)

5. Within the hour factors (peak hour factor)

6. Other unique extreme events such as storms, major entertainment events, political events, or very severe accidents that would be expected to occur infrequently over the course of a typical year

The previous section of this report provided an overview of the methodology and average toll rate results of the T&R modeling process for the I-495 and I-270 priced managed lanes. As discussed previously, the modeling process produces estimates of weekday average toll rates for the project by time period and model year. In reality, rates may vary higher or lower than the average rates, sometimes significantly, as the assumed dynamic pricing algorithm responds to changing demand for the priced managed lanes in different times of the day and on different days. Considering the list of factors that impact the dynamic toll rates above, the model inherently estimates changes in long-term factors given different model years are analyzed and changes in hour-to-hour factors given 13 different time periods are analyzed. The remaining factors were considered using post-model analysis. As described in this section, data from the existing Virginia I-495 Express Lanes was used to support the post-model analysis. The data was used to produce expected frequency distributions for the Maryland priced managed lane project rates and factors to convert the average model rates to preliminary maximum expected rates. The analysis was also informed by general CDM Smith experience working with other priced managed lane projects.

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I-495 and I-270 Priced Managed Lanes Traffic and Revenue Study

Example Off Peak Conditions:
10 and 11 AM Southbound

495 270 SOUTH

GUDE DR	$0.65
495 N. BELT	$3.33
VIRGINIA	$4.80

Toll Gantry	Distance (miles)	Gude Dr	495 N. Belt	Virginia	Per Mile Toll
23	1.8	$ 0.65	$ 0.65	$ 0.65	$ 0.36
22	2.8		$ 1.01	$ 1.01	$ 0.36
21	3		$ 1.08	$ 1.08	$ 0.36
20	1.9		$ 0.59		$ 0.31
19	2.7			$ 1.11	$ 0.41
3	3.2				$ -
2	1.2			$ 0.43	$ 0.36
1	1.4			$ 0.51	$ 0.36
Total	12.9	$ 0.65	$ 3.33	$ 4.80	
Per Mile		$ 0.36	$ 0.35	$ 0.37	

Example Peak Hour/Heavy Congestion:
6PM Northbound

Toll Gantry	Distance (miles)	MD 190	MD 187	I-370	Per Mile Toll
1	1.4	$ 3.25	$ 3.25	$ 3.25	$ 2.32
2	1.2	$ 2.79	$ 2.79	$ 2.79	$ 2.32
3	3.2		$ 7.27		$ 2.27
19	2.7			$ 4.74	$ 1.76
20	1.9				$ -
21	3			$ 4.49	$ 1.50
22	2.8			$ 4.19	$ 1.50
23	1.8			$ 2.88	$ 1.60
Total	12.9	$ 6.04	$ 13.31	$ 22.34	
Per Mile		$ 2.32	$ 2.29	$ 1.73	

495 270 NORTH

MD 190	$6.04
MD 187	$13.31
I-370	$22.34

toll sign location

Overall Notes:
1. Gantry and access configurations on Phase 1 South are subject to change during the predevelopment phase with the developer
2. Gantry and access configurations between the GW Parkway and MD 190/River Rd. interchanges are subject to change based on the ongoing Maryland-Virginia Bi-State Border Agreement discussions.

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EXAMPLE TOLL RATES TO SPECIFIC DESTINATIONS
2-AXLE ETC, 2025 MODEL YEAR IN 2021$
WITHOUT SOFT CAP

FIGURE 5

CONFIDENTIAL, PRE-DECISIONAL, DELIBERATIVE

4.1 Virginia I-495 Express Lane Data

Toll rate data for the Virginia I-495 Express Lanes was analyzed to support the preliminary toll rate process. The data was taken from email alerts received by CDM Smith staff at certain times every weekday which indicate the end-to-end tolls charged on the existing Virginia I-495 Express Lanes by direction. The end-to-end data from email alerts was also supplemented using toll rate data from I-495 Express Lane website queries for specific trips on the facility.

4.1.1 Hourly Data

CDM Smith staff have been signed up through the Transurban website (expresslanes.com) to receive emails which indicate the end to end tolls charged on the existing Virginia I-495 express lanes in each direction. The data is received one or two times per hour in the weekday peak periods and shoulder periods. This data is the source for measuring toll rate variability month-to-month factors (seasonality), day-to-day factors, and variability due to other unique extreme events. The data is from about five years, from October 2014 to December 2019. The beginning is about two years after the express lanes began tolling on November 17, 2012. An analysis process was conducted to normalize the data to account for changing trends in toll rates over the five years. These changes can be due to many factors including traffic growth, changes in willingness to pay, ramp-up, and better connectivity to other regional facilities including the I-95 express lanes which began tolling on December 29, 2014.

Figures 6 and 7 provide example time series scatterplots of the per mile toll rates charged in the southbound direction from 4-5 PM and in the northbound direction from 7-8 AM, respectively. Similar scatterplots were also generated for the other peak travel hours. The mileage assumed for the express lanes to calculate the per mile toll was 10.3 miles. This corresponds to the shortest distance trip possible on the facility that can be traveled when paying the full-length toll, from the slip ramps just north of the Dulles interchange to the slip ramps just east of the Braddock Road interchange.

Figures 6 and 7 show that tolls on the express lanes have been increasing steadily over the past 5 years, with higher increases in the southbound direction. One exception is the southbound direction tolls showed a different trend in the first half of 2017. One theory for this different trend is that the tolling algorithm may have been modified around this time. The scatterplots for the other hours in the southbound direction exhibited the same anomalous 2017 tolls, whereas in the northbound scatterplots, 2017 was consistent with other years. To prevent 2017 toll rates from distorting results, the 2017 data was removed from the analysis detailed in subsequent sub-sections of this report.

The slope of the trendlines in **Figures 6 and 7** was used to normalize the data to January 1st, 2020. **Figures 8 and 9** show the result of this adjustment for the example hours. Similar adjustments for the other hours were also performed.

**Figure 6 – Virginia I-495 Express Lane Average Weekday End to End Per Mile Tolls
from October 2014 to December 2019, Southbound 4-5 PM**

$y = 0.0007x - 28.167$
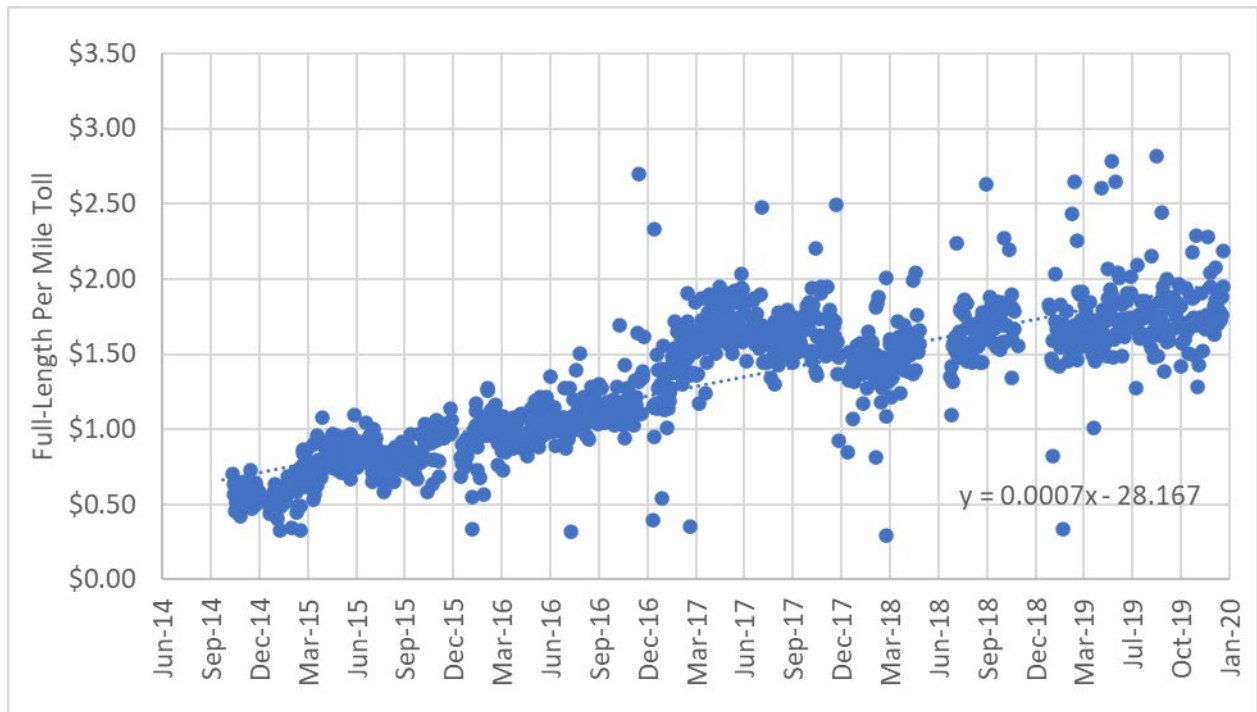
**Figure 7 – Virginia I-495 Express Lane Average Weekday End to End Per Mile Tolls
From October 2014 to December 2019, Northbound 7-8 AM**

$y = 0.0002x - 7.843$
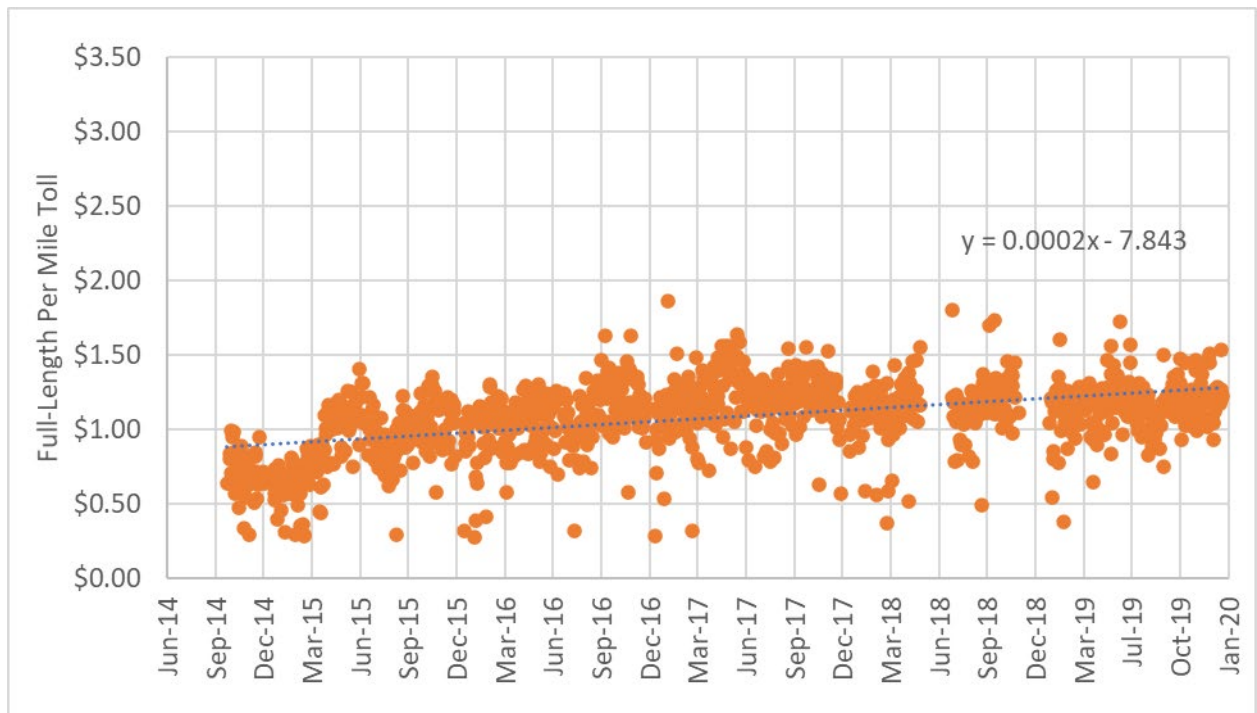
**Figure 8 – Virginia I-495 Express Lane Average Weekday End to End Tolls
From October 2014 to Dec 2019, Southbound 4-5 PM, Normalized for Long-Term Trend**

$y = -1E-06x + 2.0455$
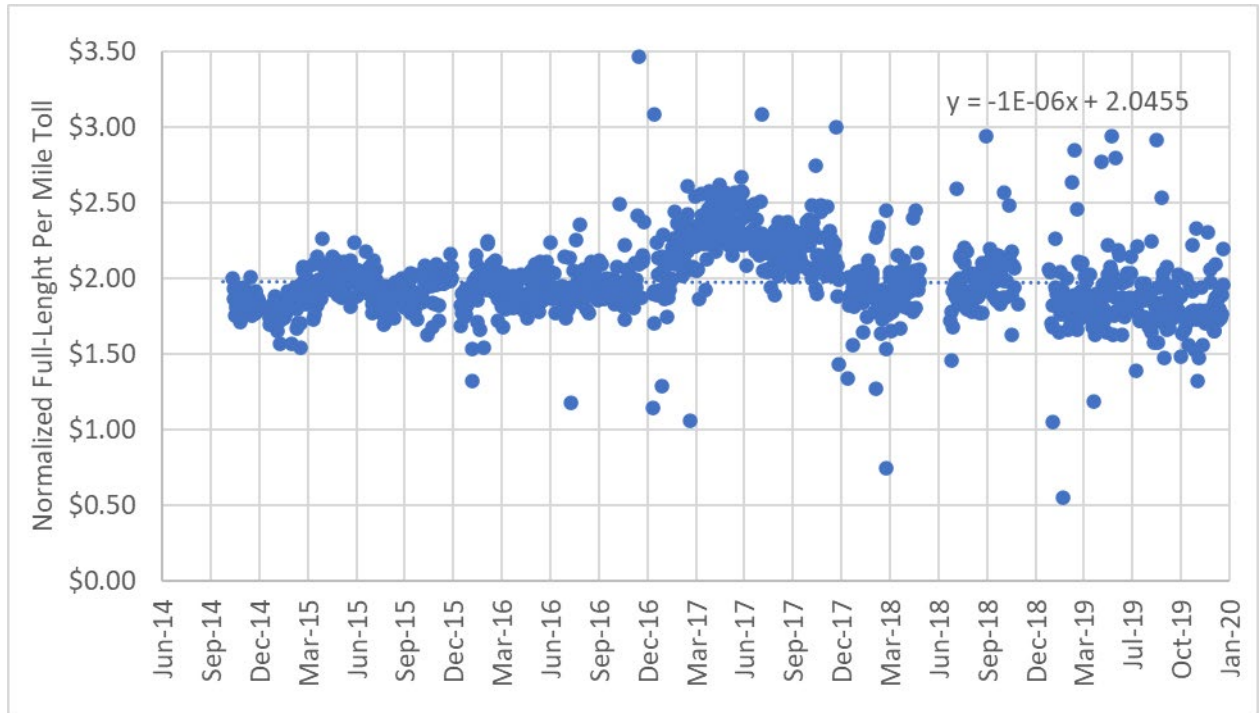
**Figure 9 – Virginia I-495 Express Lane Average End to End Tolls
From October 2014 to December 2019, Northbound 7-8 AM, Normalized for Long-Term Trend**

$y = 4E-06x + 1.0932$
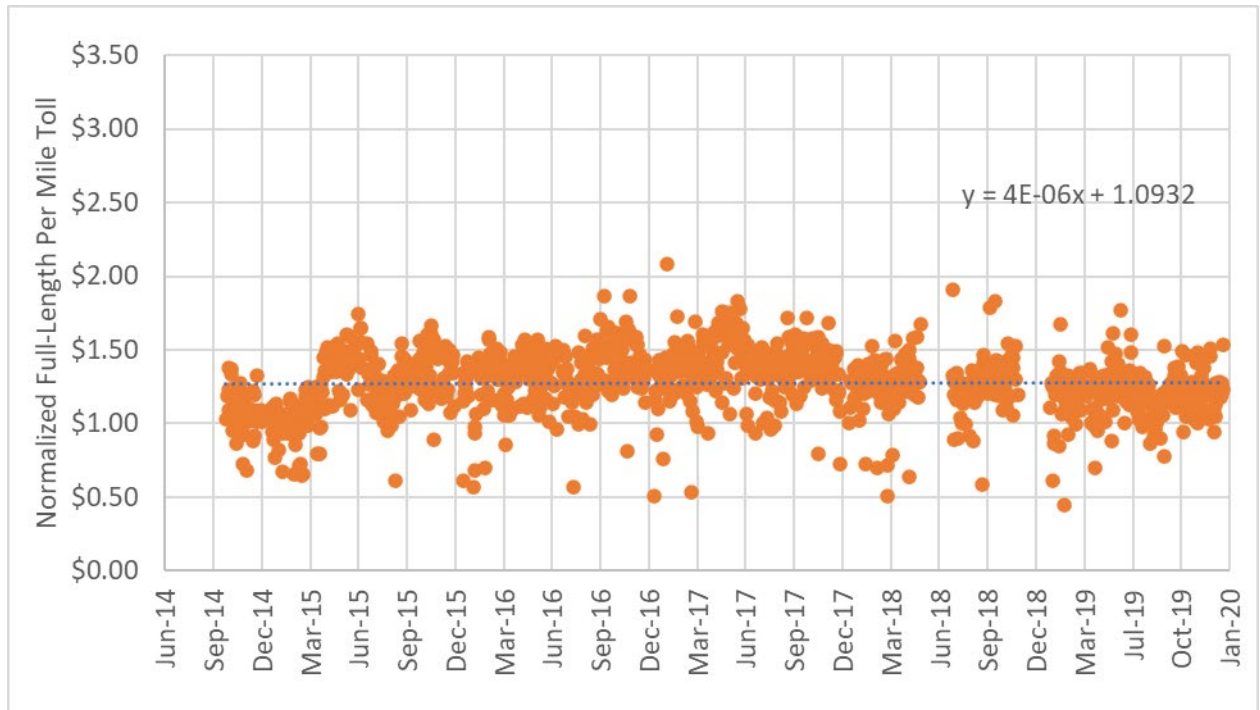
4.1.2 Five Minute Data

The end-to-end toll rate data is received every hour or half hour, so it is not possible to analyze variability within the hour in detail. Therefore, the end-to-end data from email alerts was supplemented by toll rate data from I-495 Express Lane website queries for specific trips on the facility. In mid-December 2019, CDM Smith began collecting data from the VA Express Lanes website at five-minute intervals using the "Map your trip" feature, to observe variability within the hour. **Figure 10** provides an example of this data on one day, December 19th for northbound end to end trips. This data was collected in each direction for each weekday from December 16th, 2019 to January 14th, 2020, excluding holidays. This data was used to analyze the variability of toll rates within an hour as described in a later section of this memo.

**Figure 10 – VA Express Lane Example Average Five-Minute Data
Dec 19, 2019 Northbound End-to-End Toll**

4.2 Month-to-Month Toll Rate Factors (Seasonality)

This and the next few subsections detail analysis methods for estimating the dynamic pricing variability factors listed at the beginning of this section that are not inherently estimated in the modeling process.

Using the Virginia I-495 express lane trend-adjusted data, the average tolls charged in each month were divided by the average tolls charged over the entire five year period. These ratios were the "seasonality factors". This factor was computed for each of the six hours represented in the data in each month from October 2014 to December 2019. These factors can be multiplied by average annual weekday toll rates to estimate toll rates that could be expected in different months of the year.

After grouping all the January factors together, all the February factors, etc., standard statistical techniques were used to develop 90 percent confidence ranges for these seasonality factors, accounting for the sample sizes, means and standard deviations. A 90 percent confidence range was considered appropriate when evaluating the seasonality factors due to inherent uncertainty in the seasonality analysis process.

Table 4 shows the seasonality factors for each month, representing the ratio of average trend-adjusted tolls charged in that month to average trend-adjusted tolls charged over the entire five-year period (excluding 2017 for reasons discussed previously).

Table 4 – Month-to-Month Seasonality Factors from VA I-495 Express Lane Toll Data

Month	Factor	90% Confidence Range	
		Lower Bound	Upper Bound
Jan	0.90	0.87	0.93
Feb	0.97	0.94	1.00
Mar	0.97	0.95	0.99
Apr	1.01	0.98	1.04
May	1.04	1.03	1.06
Jun	1.06	1.03	1.08
Jul	1.01	0.99	1.03
Aug	0.94	0.92	0.97
Sep	1.03	1.01	1.05
Oct	1.02	1.00	1.04
Nov	1.02	0.99	1.05
Dec	1.05	1.01	1.09
Maximum	**1.06**	**1.03**	**1.09**

4.3 Toll Rate Variability Day to Day and Due to Other Unique Events

With the same trend-adjusted data, the day-to-day variability and variability due to other unique events was measured by computing a ratio of toll charged for each day to the average toll of the entire five-year period with data available. **Table 5** presents percentiles of these ratios, for each peak hour and direction. It also includes data for the two-hour period of 4 to 6 PM in the southbound direction, to correspond with the model two-hour PM peak period. Note that the southbound direction on the Virginia I-495 Express Lanes experiences the highest toll rates while the northbound direction in the Maryland project is estimated to have the highest toll rates.

Table 5 – Percentiles of the Ratio of Toll Charged on a Specific Day Versus the Average Toll Oct 2014 to Dec 2019

Percentile	Northbound			Southbound			
	7-8AM	8-9AM	9-10AM	4-5PM	5-6PM	4-6PM	6-7PM
75th	1.10	1.10	1.13	1.04	1.04	1.04	1.06
90th	1.19	1.19	1.24	1.10	1.11	1.10	1.19
95th	1.24	1.22	1.32	1.13	1.20	1.16	1.29
99th	1.34	1.30	1.55	1.34	1.37	1.36	1.54
100th	1.53	1.61	1.97	1.81	1.74	1.81	1.85

A few examples of the way to interpret **Table 5** are as follows:

1. 25 percent of all tolls charged southbound from 5-6 PM were more than 4 percent higher than the average (factor of 1.04)

2. 5 percent of all tolls charged northbound from 7-8 AM were more than 24 percent higher than the average (factor of 1.24)

Some notable observations from **Table 5** are:

3. Ratios were highest in the third hour of each peak (6-7 PM and 9-10 AM), meaning that even though tolls were lower later in the peak, there was more variability later in the peak.

4. Ratios were lowest in the southbound direction from 4-5 PM, and in general lower in the PM peak direction than the AM. Tolls were higher in the PM peak direction, meaning that congestion was more severe. Thus, at higher levels of congestion, there was less day to day variability.

In the case of day to day variability, the number of observations is much larger than the case of the seasonality factors, since each day corresponds to an observation. Thus, instead of constructing confidence intervals, the percentiles as shown in **Table 5** can be used directly for how high tolls are likely to vary from the mean.

4.4 Toll Rate Variability Within Time Periods (Peak Hour Factor)

The average and maximum tolls charged in each of the peak hours on each day were calculated using the five-minute toll data from December 2019 to January 2020 described previously. The peak hour factor was calculated as the ratio of the maximum to the average. For this analysis, it represents the relationship between the maximum toll within an hour or time period and the average tolls estimated in the T&R analysis time periods. **Table 6** presents estimates of the peak hour factors for each hour in each direction on the VA I-495 express lanes. Due to the small sample size, a 90 percent confidence ranges for these peak hour factors was estimated.

Table 6 – Weekday Peak Hour Factors in VA I-495 Express Lanes

Direction	Time Period	Factor	90% Confidence Range	
			Lower Bound	Upper Bound
Northbound	7-8 AM	1.15	1.12	1.17
	8-9 AM	1.11	1.07	1.14
	9-10 AM	1.17	1.11	1.22
Southbound	4-5 PM	1.19	1.15	1.22
	5-6 PM	1.10	1.07	1.12
	4-6 PM	1.23	1.20	1.27
	6-7 PM	1.30	1.24	1.36

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To correspond to the model time periods, a two-hour factor for 4 to 6 PM was also computed. That factor was 1.23, with its 90 percent confidence interval ranging from 1.20 to 1.27. Note that this factor covers both the variability within the peak hour and the variability between the two hours (4-5 and 5-6 PM) which make up the time period of highest congestion in the model that produced the traffic and revenue forecasts.

4.5 Frequency Histograms

Another way of analyzing the Virginia I-495 Express Lane toll rate data was to compute the share of toll rates compared to average. This analysis was used to support analysis of soft caps as described later in this report. Data from both directions for all non-holiday weekdays between January 1, 2018 and December 31, 2019 was utilized for the frequency analysis. The data times analyzed were 8:00 AM, 9:30 AM, 11:00 AM, 3:30 PM, 5:00 PM, 6:30 PM, and 7:30 PM. These times were selected as the midpoints of time periods used by CDM Smith for the modeling and based on data availability from the email alerts.

Using this data, the average toll rate for each of the times was calculated. CDM Smith then calculated the ratio between the toll rate on a given day versus the average toll rate by time. For example, if the 2018 to 2019 average weekday northbound 8:00 AM toll rate for a full-length trip was $5.00, but on a specific day the toll rate was $6.00, then the ratio would be calculated as 1.20. **Figures 6 through 19** contain histograms which illustrate the spread of the Virginia I-495 Express Lane toll rates by direction and by time period. It should be noted the Virginia I-495 Express Lanes facility has the highest toll rates in the PM in the southbound direction and the AM in the northbound direction.

Figure 6 – Northbound 8:00 AM Distribution of Full-Length Virginia I-495 Express Lane Hourly Toll Rates
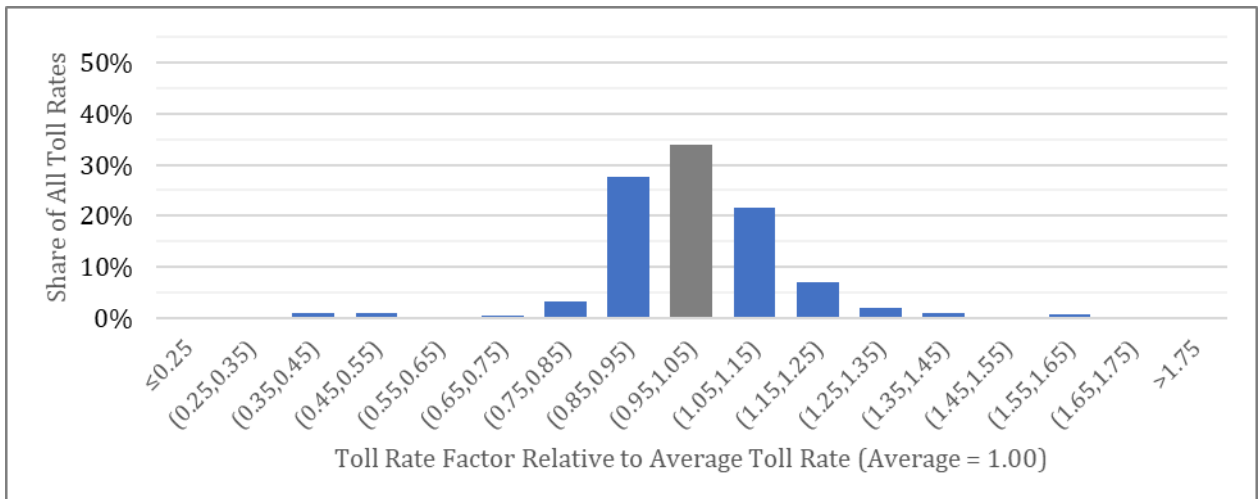
Figure 7 – Northbound 9:30 AM Distribution of Full-Length Virginia I-495 Express Lane Hourly Toll Rates
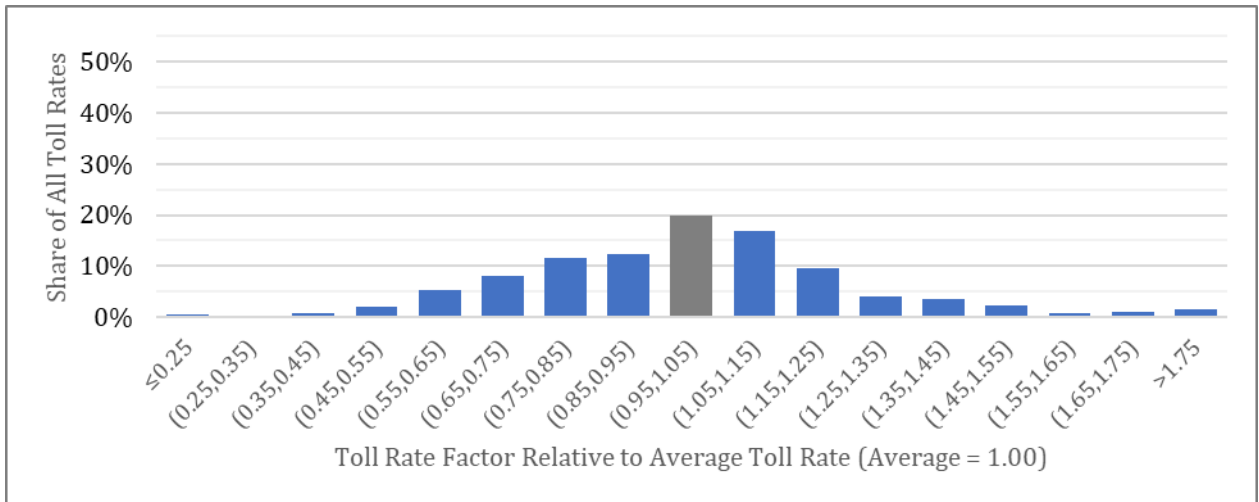
Figure 8 – Northbound 11:00 AM Distribution of Full-Length Virginia I-495 Express Lane Hourly Toll Rates
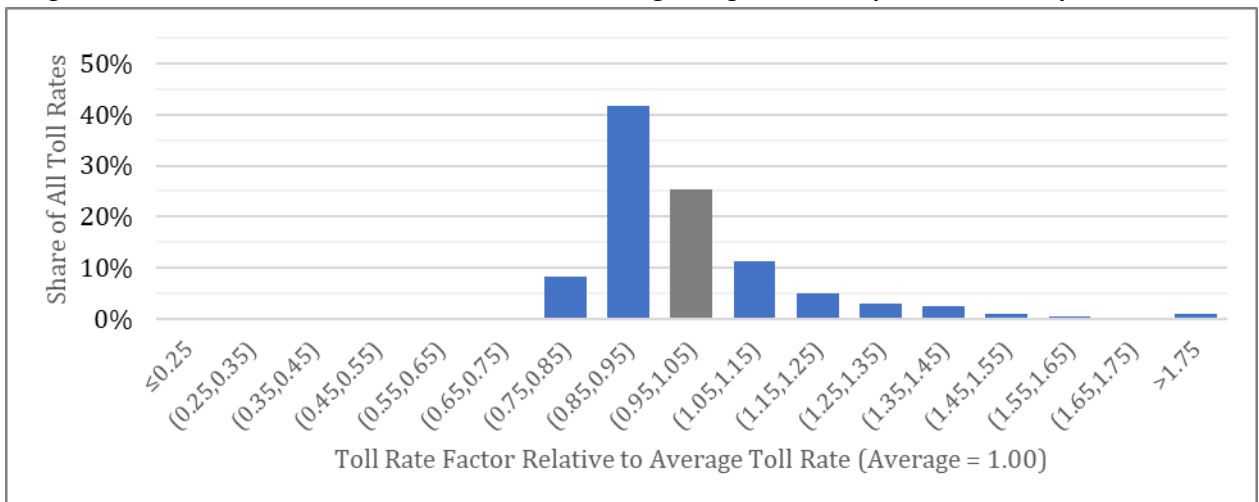
Figure 9 – Northbound 3:30 PM Distribution of Full-Length Virginia I-495 Express Lane Hourly Toll Rates
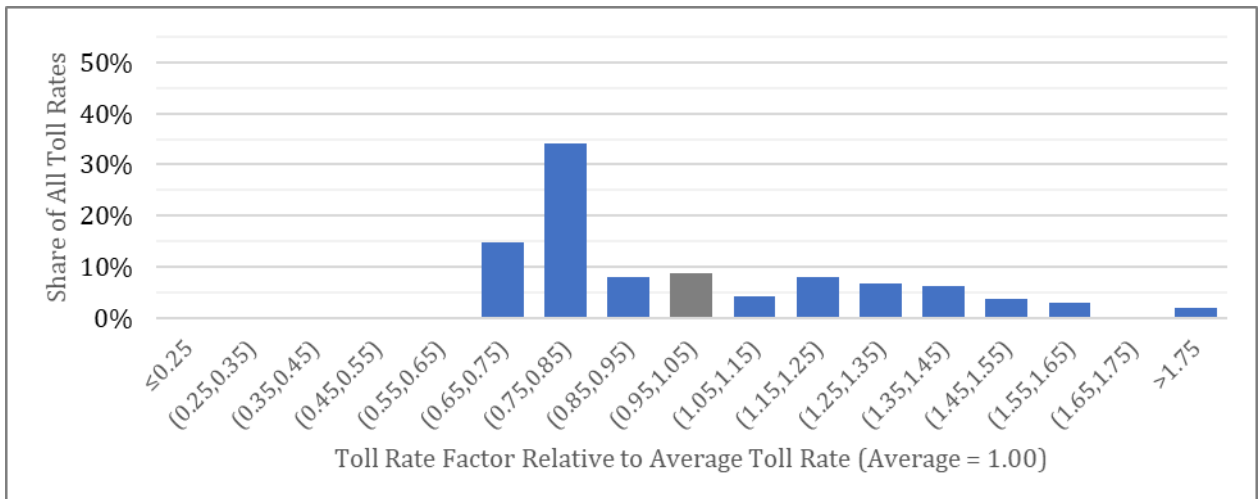
Figure 10 – Northbound 5:00 PM Distribution of Full-Length Virginia I-495 Express Lane Hourly Toll Rates
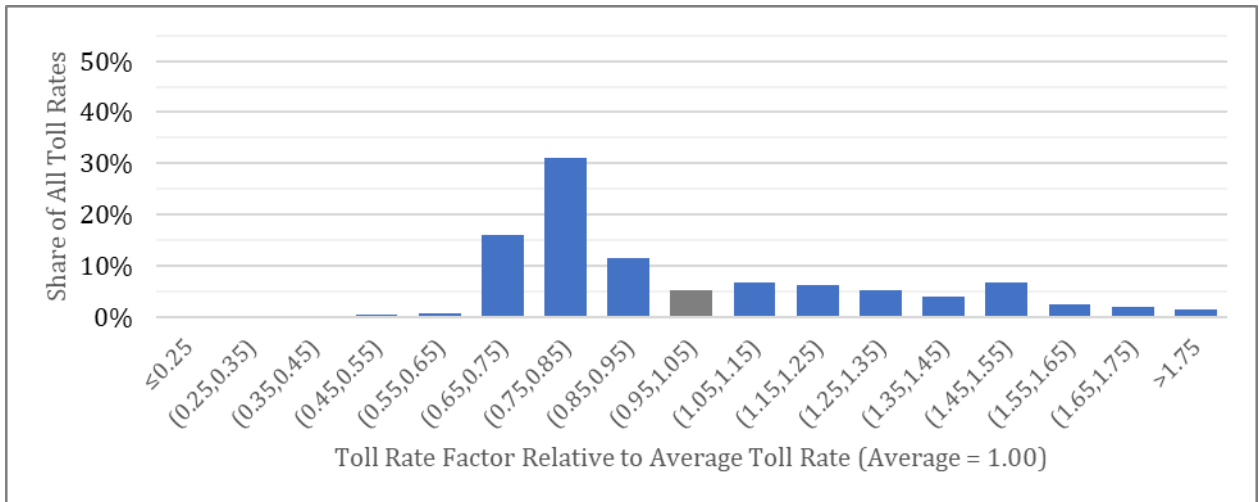
Figure 11 – Northbound 6:30 PM Distribution of Full-Length Virginia I-495 Express Lane Hourly Toll Rates
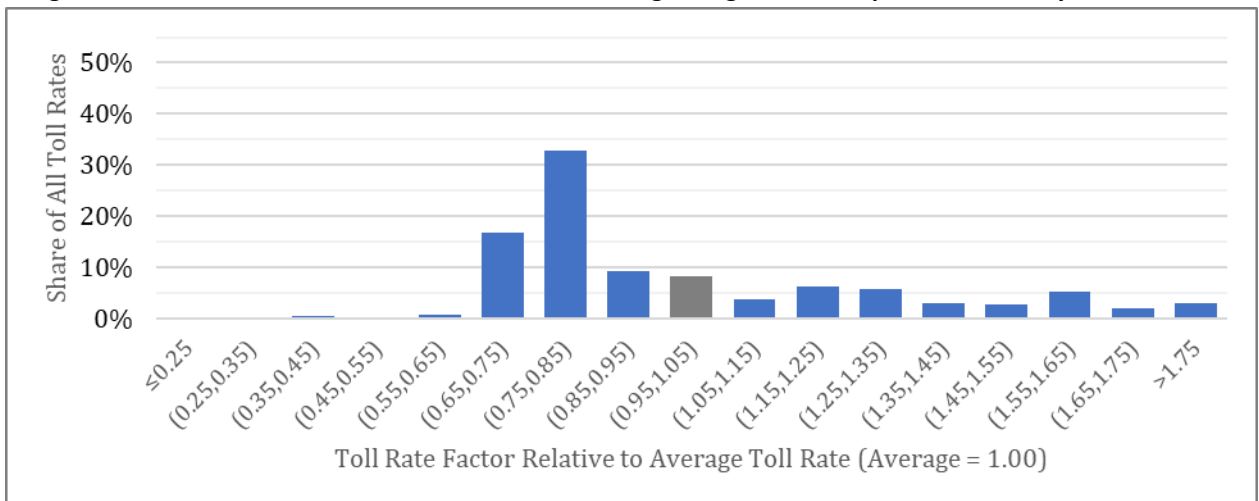
Figure 12 – Northbound 7:30 PM Distribution of Full-Length Virginia I-495 Express Lane Hourly Toll Rates
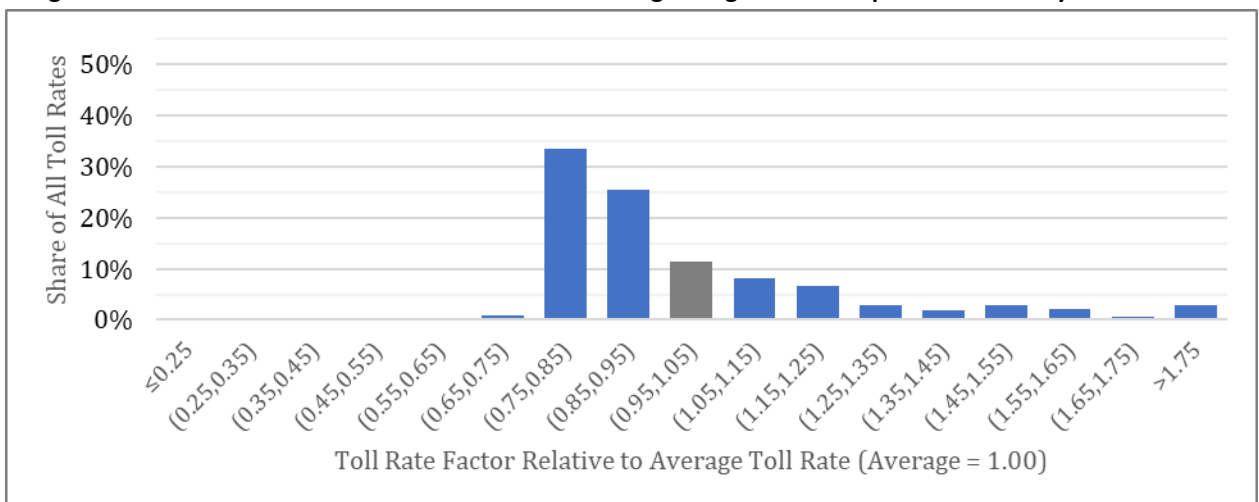
Figure 13 – Southbound 8:00 AM Distribution of Full-Length Virginia I-495 Express Lane Hourly Toll Rates
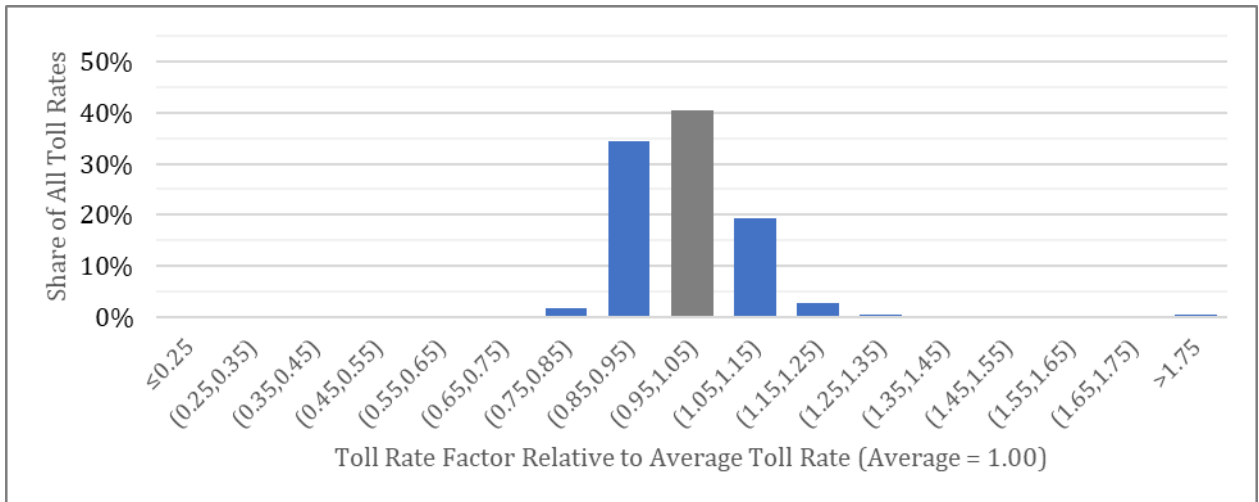
Figure 14 – Southbound 9:30 AM Distribution of Full-Length Virginia I-495 Express Lane Hourly Toll Rates
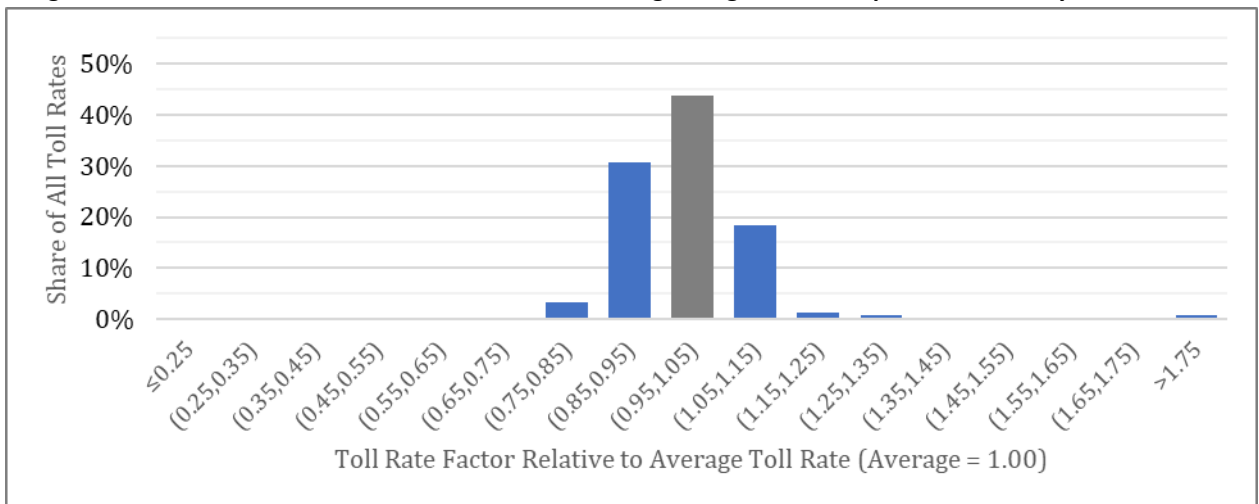
Figure 15 – Southbound 11:00 AM Distribution of Full-Length Virginia I-495 Express Lane Hourly Toll Rates
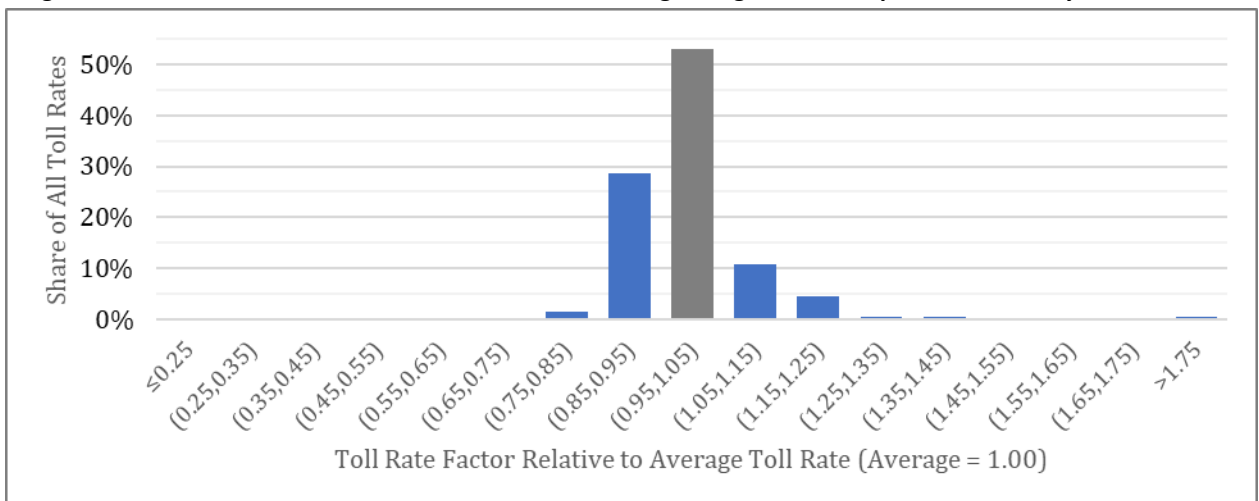
Figure 16 – Southbound 3:30 PM Distribution of Full-Length Virginia I-495 Express Lane Hourly Toll Rates
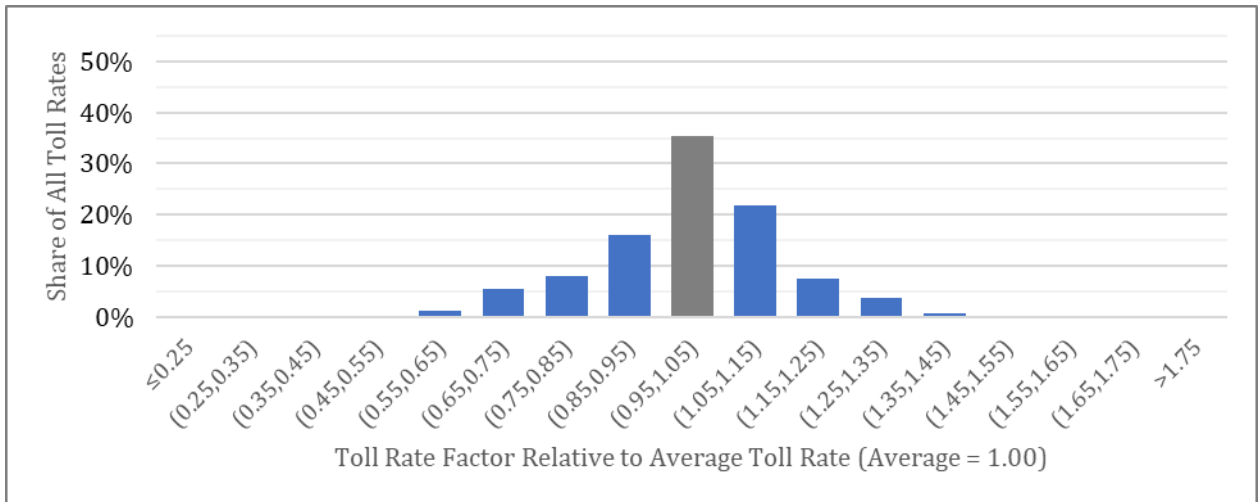
Figure 17 – Southbound 5:00 PM Distribution of Full-Length Virginia I-495 Express Lane Hourly Toll Rates
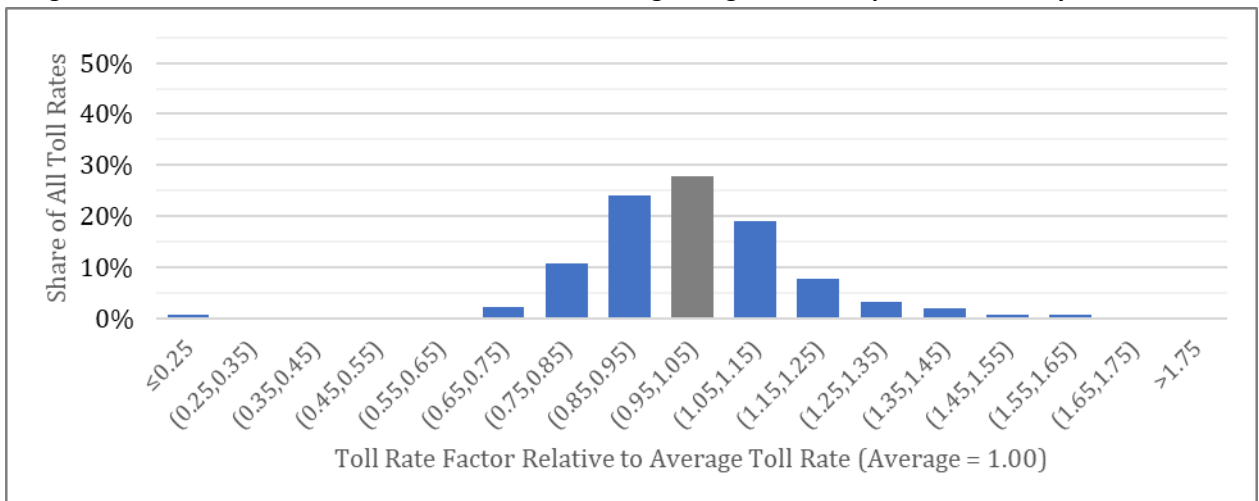
Figure 18 – Southbound 6:30 PM Distribution of Full-Length Virginia I-495 Express Lane Hourly Toll Rates
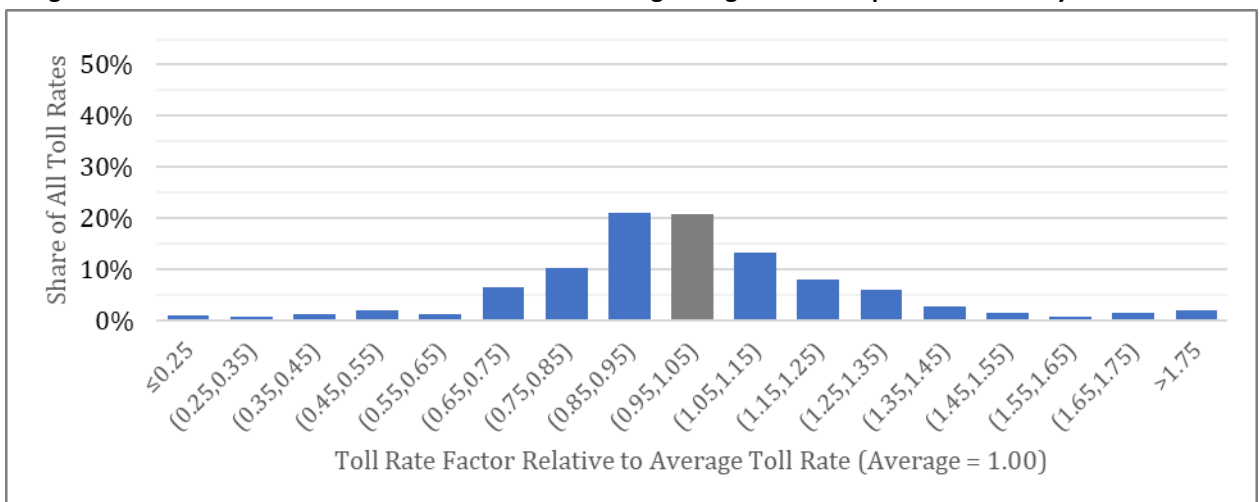
Figure 19 – Southbound 7:30 PM Distribution of Full-Length Virginia I-495 Express Lane Hourly Toll Rates
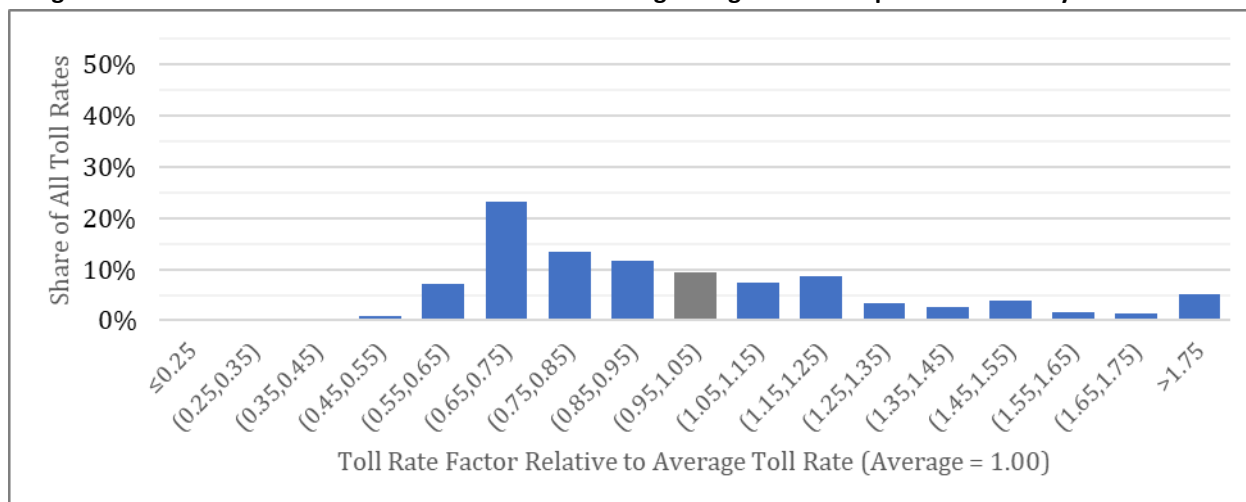
5. Maximum Toll Rates

The maximum toll rate is a key element of the preliminary toll rates and corresponds to the highest toll rate per mile that can be charged on the facility. Maximum toll rates were assumed to be applicable by segment. It should be noted that it is not common to have maximum toll rates among other P3 priced managed lane projects, but the setting of the maximum toll rate is required under Maryland law. Maximum toll rates are also assumed to be subject to escalation over time in the work thus far for the preliminary toll rates. Escalation is discussed in more detail later in this report.

CDM Smith supported the preliminary maximum toll rate estimation process using the estimation methodology described below. Assumptions in the analysis methodology were made so the resulting estimated maximum toll rate would be anticipated to be reached very infrequently on any toll rate segments on the project.

1. Determine the highest average toll rate from the modeling results of all gantries and model time periods. This was a passenger car ETC rate of $2.25 per mile (2025 model in 2019$) which was estimated to occur at gantries 1 and 2 in the 6 to 7 PM time period. Using a 2019 to 2021 inflation assumption this becomes $2.32 in 2021$ as shown previously in **Table 1** "6 PM" column for gantries 1 and 2.

2. Apply factors to the model resulting toll rates to consider toll rate variability not inherently assumed in the model. Specifically, this includes three sets of factors: Month-to-month (seasonality) factors, day-to-day/other unique event factors, and within the hour factors. Month-to-month (seasonality) factors were previously included in **Table 4.** The 90 percent confidence range upper bound factor of 1.09 was used. A confidence range upper bound was used to account for inherent uncertainty due to limited data availability and other uncertainty in the analysis process.

3. The day-to-day/other unique event factors were previously included in this report in **Table 5**. Based on discussions with the project team, the 90th percentile day-to-day factor

of 1.19 (for the 6 to 7 PM period) was used. A confidence internal was not used for the day-to day factor because of the large number of data points used. Note that the analysis approach to the day-to-day factor inherently includes days with unique-type events. It also should be noted that the Virginia I-495 Express Lanes PM peak is in the southbound direction and the anticipated Maryland Phase 1 South PM peak is in the northbound direction. Therefore, factors from the southbound direction were used for gantries 1 and 2 in the Maryland project, which are in the northbound direction.

4. The within the hour factors were provided previously in **Table 6** of this report. Similar to the month-to-month factor, the 90 percent confidence range upper bound within the hour factor was used to account for inherent uncertainty due to limited data availability and other uncertainty in the analysis process. For the southbound 6 to 7 PM time period, this 90 percent confidence range factor was 1.36.

5. The maximum toll rate was multiplied by the factors listed above: $2.32 * 1.09 * 1.19 * 1.36 = $4.10. This is the estimated preliminary maximum toll rate for the 2025 model year in 2021$.

6. The preliminary maximum toll rate was converted to 2021 in 2021$ using an assumed real escalation rate of 2.1 percent annually. Thus the $4.10 (2025 in 2021$) was deflated to $3.76 (2021 in 2021$). The source of the 2.1 percent annual real escalation assumption is detailed later in this report.

As stated previously, the preliminary maximum estimated toll rate was estimated to occur very infrequently. For example, on a daily basis, the day-to-day factor was chosen at a 90th percentile level. So, of the approximately 252 weekdays per year only 10 percent or about 25 days would be assumed to have higher rates. A seasonal factor was also applied that took the highest seasonal factor of any month. So, one could divide the 25 days by 12 months to result in about 2 days per year.

As a point of comparison related to the maximum toll rates, the passenger car ETC tolls on the existing Virginia I-495 Express Lanes reached levels approaching $3.00 per mile several days in the past in the plots shown previously in **Figure 6**. When the rates were normalized to consider growth over time as shown in **Figure 8**, several historical days had rates near or over $3.00. It should be noted that these rates are based on full-length trips on the I-495 Express Lanes. Experience has shown that if the full-length toll rates averaged $3.00 per mile on some days on the Virginia I-495 Express Lanes, certain individual gantries would likely be even higher than the overall average given the nature of dynamic pricing and variability in congestion on the facility. Thus, the $3.76 per mile (2021 in 2021$) preliminary maximum per mile estimated for the Maryland project seems generally similar to maximum gantry-level rates likely to have experienced very infrequently in the past on the Virginia I-495 Express Lanes.

6.Soft Rate Cap

The soft rate cap is the rate that can only be exceeded during times of deteriorating performance and when necessary to provide customers who choose to pay a toll a faster and more reliable trip at or above 45 miles per hour. A passenger car ETC soft cap rate of $1.50 per

mile was assumed for the preliminary toll rate analysis. Also, it was assumed traffic volumes must exceed at least 1,600 passenger car equivalent vehicles per hour per lane (PCEphpl) or speeds must drop below 50 miles per hour during a five-minute period for the soft cap rate to be exceeded in the next five-minute period. The PCE calculation assumed an equivalency factor of 2.5 for each 3-or-more axle vehicle. The results in this section are for model year 2025. Model year 2021 results are included in Section 8.

6.1 Average Toll Rates with Soft Cap

Tables 7, 8, and 9 show similar average toll results as presented previously in **Tables 1, 2, and 3** but with the soft caps incorporated into the modeling process. Also, due to the timing of when the soft cap analysis for the preliminary toll rates was performed, the model runs supporting **Tables 7, 8, and 9** include different configuration assumptions for the northbound and southbound segments between the George Washington Memorial Parkway and River Road/MD 190 compared to **Tables 1, 2, and 3**. It was assumed that Virginia toll policies would apply to Gantry 1 and, therefore, this gantry would not be subject to the soft cap. These reflect assumptions related to the Maryland-Virginia Cross-Border Agreement. As described in the introduction to this report, CDM Smith believes that the findings presented in this report related to the preliminary toll rates would be suitable for all different configurations that have been discussed to date related to the Cross-Border Agreement.

As identified in **Table 7** in red font, the assumed $1.50 soft cap (2021 in 2021$), which would be $1.63 for the 2025 model year (2021$) is estimated to be reached during average conditions at Gantry 3 during the 6 PM time period and at Gantry 19 during the 4 to 5 PM and 6 PM time periods.

Two examples of how the toll rate signs may look to drivers are provided in **Figure 20**. This figure is similar to **Figure 5** but also includes the impacts of the soft cap.

6.2 Soft Cap Frequency Estimates

Other gantries and time periods would also be expected to reach or exceed the soft cap during non-average conditions. An estimate of the frequency of this occurring at all gantries during all time periods was made using a post-model analysis process. The first step was calculating the ratio of the soft cap divided by the average toll rate estimated by the model for a given gantry and time period. This ratio was then compared against the Virginia 495 Express Lane toll rate distributions (illustrated previously in **Figures 6 through 19**) to estimate in what percentile this ratio fell in the distribution. Because of different peaking characteristics, the Virginia 495 Express Lane toll rate distributions for the northbound direction were used for the southbound Maryland project and vice versa. As an example, as shown in **Table 7** the 2025 model-estimated average toll rate was $1.03 (2021$) at Gantry 101 in the 3 PM hour. The soft cap was calculated to be 158% of the average toll rate ($1.63 divided by $1.03). This corresponded with the 96th percentile of the Virginia 495 toll rate distribution for northbound 3:30 PM (see **Figure 9**), implying that the soft toll rate cap would be reached or exceeded in four percent of the weekdays. Given the assumption of 252 non-holiday weekdays per year, the soft toll rate cap was estimated to be reached or exceeded on 11 weekdays per year (four percent of 252 weekdays) in this example.

Table 7 – 2025 Estimated Weekday Average Per Mile Toll Rates per Gantry in 2021$*
Passenger Car ETC, Phase 1 South
At $1.50 (2021$) Soft Cap, 1600 PCEphpl or 50 Mile Per Hour Soft Cap Thresholds
$1.50 (2021$) Soft Cap in 2021 Escalated 2.1% Annually Equals $1.63 (2021$) Soft Cap in 2025
Rates in Red were Estimated to Reach or Exceed the Soft Cap

Roadway	Toll Gantry	Dist. (miles)	5 AM	6 AM	7 & 8 AM	9 AM	10 AM & 11 AM	12 PM and 1 PM	2 PM	3 PM	4 & 5 PM	6 PM	7 PM	8 PM	12 PM to 4 AM
MD I-495 IL (VA Toll Policy)	1	2.6	$0.31	$0.83	$1.60	$0.93	$0.46	$0.41	$0.98	$1.24	$2.37	$2.32	$0.83	$0.31	$0.21
MD I-495 Outer Loop	101	2.6	$0.36	$0.77	$0.88	$0.88	$0.41	$0.36	$0.46	$1.03	$1.29	$0.98	$0.36	$0.21	$0.21
MD I-495 Inner Loop	3	3.2	$0.36	$0.83	$1.29	$0.77	$0.41	$0.41	$1.03	$1.03	$1.39	**$1.63**	$0.83	$0.31	$0.21
MD I-495 Outer Loop	103	3.2	$0.36	$0.52	$0.67	$0.72	$0.36	$0.36	$0.57	$0.98	$1.34	$0.93	$0.36	$0.21	$0.21
MD I-495 IL / I-270 W Spur NB	19	2.7	$0.21	$0.88	$0.88	$0.41	$0.21	$0.36	$0.67	$1.14	**$1.63**	**$1.63**	$0.57	$0.21	$0.21
MD I-495 OL / I-270 W Spur SB	119	2.7	$0.36	$0.67	$1.03	$0.88	$0.41	$0.36	$0.36	$0.67	$1.08	$0.88	$0.31	$0.21	$0.21
I-270 E Spur NB	20	1.9	$0.21	$0.21	$0.21	$0.21	$0.21	$0.21	$0.31	$0.41	$0.72	$0.88	$0.52	$0.21	$0.21
I-270 E Spur SB	120	1.9	$0.21	$0.52	$0.93	$0.88	$0.31	$0.21	$0.21	$0.21	$0.36	$0.21	$0.21	$0.21	$0.21
I-270 Northbound	21	3	$0.21	$0.41	$0.41	$0.36	$0.21	$0.31	$0.52	$0.88	$1.55	$1.50	$0.57	$0.21	$0.21
I-270 Southbound	121	3	$0.21	$0.62	$1.03	$0.93	$0.36	$0.36	$0.31	$0.41	$0.46	$0.57	$0.21	$0.21	$0.21
I-270 Northbound	22	2.8	$0.21	$0.36	$0.36	$0.36	$0.21	$0.36	$0.52	$0.77	$1.50	$1.50	$0.57	$0.21	$0.21
I-270 Southbound	122	2.8	$0.21	$0.67	$1.24	$1.08	$0.36	$0.36	$0.31	$0.36	$0.41	$0.41	$0.21	$0.21	$0.21
I-270 Northbound	23	1.8	$0.21	$0.36	$0.36	$0.36	$0.21	$0.36	$0.57	$0.83	$1.55	$1.60	$0.57	$0.21	$0.21
I-270 Southbound	123	1.8	$0.21	$0.67	$1.34	$1.08	$0.36	$0.36	$0.31	$0.31	$0.36	$0.36	$0.21	$0.21	$0.21
Full Length Northbound	**1,2,19,21,22,23**	**12.9**	**$0.23**	**$0.58**	**$0.73**	**$0.49**	**$0.26**	**$0.36**	**$0.65**	**$0.97**	**$1.72**	**$1.71**	**$0.62**	**$0.23**	**$0.21**
Full Length Southbound	**101,102,119,121,122,123**	**12.9**	**$0.27**	**$0.68**	**$1.09**	**$0.96**	**$0.38**	**$0.36**	**$0.35**	**$0.57**	**$0.74**	**$0.65**	**$0.26**	**$0.21**	**$0.21**

*The configuration between GW Parkway and River Rd/MD 190 (corresponding to Gantry 1/101 in this table) are under discussion with Virginia as part of the Capital Beltway Accord. All configurations on Phase 1 South are subject to change during the predevelopment phase with the developer

Table 8 – 2025 Estimated Weekday Average Toll Rates per Gantry in 2021$*
Passenger Car ETC, Phase 1 South
At $1.50 (2021$) Soft Cap, 1600 PCEphpl or 50 Mile Per Hour Soft Cap Thresholds
$1.50 (2021$) Soft Cap in 2021 Escalated 2.1% Annually Equals $1.63 (2021$) Soft Cap in 2025

Roadway	Toll Gantry	Dist. (miles)	5 AM	6 AM	7 & 8 AM	9 AM	10 AM & 11 AM	12 PM and 1 PM	2 PM	3 PM	4 & 5 PM	6 PM	7 PM	8 PM	12 PM to 4 AM
MD I-495 IL (VA Toll Policy)	1	2.6	$0.81	$2.15	$4.16	$2.42	$1.21	$1.07	$2.55	$3.22	$6.17	$6.04	$2.15	$0.81	$0.54
MD I-495 Outer Loop	101	2.6	$0.94	$2.01	$2.28	$2.28	$1.07	$0.94	$1.21	$2.68	$3.36	$2.55	$0.94	$0.54	$0.54
MD I-495 Inner Loop	3	3.2	$1.16	$2.64	$4.13	$2.48	$1.32	$1.32	$3.30	$3.30	$4.46	$5.22	$2.64	$0.99	$0.66
MD I-495 Outer Loop	103	3.2	$1.16	$1.65	$2.15	$2.31	$1.16	$1.16	$1.82	$3.14	$4.29	$2.97	$1.16	$0.66	$0.66
MD I-495 IL / I-270 W Spur NB	19	2.7	$0.56	$2.37	$2.37	$1.11	$0.56	$0.98	$1.81	$3.07	$4.40	$4.40	$1.53	$0.56	$0.56
MD I-495 OL / I-270 W Spur SB	119	2.7	$0.98	$1.81	$2.79	$2.37	$1.11	$0.98	$0.98	$1.81	$2.93	$2.37	$0.84	$0.56	$0.56
I-270 E Spur NB	20	1.9	$0.39	$0.39	$0.39	$0.39	$0.39	$0.39	$0.59	$0.78	$1.37	$1.67	$0.98	$0.39	$0.39
I-270 E Spur SB	120	1.9	$0.39	$0.98	$1.77	$1.67	$0.59	$0.39	$0.39	$0.39	$0.69	$0.39	$0.39	$0.39	$0.39
I-270 Northbound	21	3	$0.62	$1.24	$1.24	$1.08	$0.62	$0.93	$1.55	$2.63	$4.65	$4.49	$1.70	$0.62	$0.62
I-270 Southbound	121	3	$0.62	$1.86	$3.10	$2.79	$1.08	$1.08	$0.93	$1.24	$1.39	$1.70	$0.62	$0.62	$0.62
I-270 Northbound	22	2.8	$0.58	$1.01	$1.01	$1.01	$0.58	$1.01	$1.45	$2.17	$4.19	$4.19	$1.59	$0.58	$0.58
I-270 Southbound	122	2.8	$0.58	$1.88	$3.47	$3.04	$1.01	$1.01	$0.87	$1.01	$1.16	$1.16	$0.58	$0.58	$0.58
I-270 Northbound	23	1.8	$0.37	$0.65	$0.65	$0.65	$0.37	$0.65	$1.02	$1.49	$2.79	$2.88	$1.02	$0.37	$0.37
I-270 Southbound	123	1.8	$0.37	$1.21	$2.42	$1.95	$0.65	$0.65	$0.56	$0.56	$0.65	$0.65	$0.37	$0.37	$0.37
Full Length Northbound	**1,2,19,21,22,23**	**12.9**	**$2.93**	**$7.42**	**$9.43**	**$6.28**	**$3.33**	**$4.64**	**$8.38**	**$12.57**	**$22.20**	**$22.00**	**$8.00**	**$2.93**	**$2.66**
Full Length Southbound	**101,102,119,121,122,123**	**12.9**	**$3.48**	**$8.77**	**$14.05**	**$12.42**	**$4.93**	**$4.66**	**$4.54**	**$7.30**	**$9.48**	**$8.43**	**$3.34**	**$2.66**	**$2.66**

*The configuration between GW Parkway and River Rd/MD 190 (corresponding to Gantry 1/101 in this table) are under discussion with Virginia as part of the Capital Beltway Accord. All configurations on Phase 1 South are subject to change during the predevelopment phase with the developer

Table 9 – 2025 Estimated Weekday Average Toll Rates Per Trip in 2021$*
Passenger Car ETC, Phase 1 South
At $1.50 (2021$) Soft Cap, 1600 PCEphpl or 50 Mile Per Hour Soft Cap Thresholds
$1.50 (2021$) Soft Cap in 2021 Escalated 2.1% Annually Equals $1.63 (2021$) Soft Cap in 2025

Direction	5 AM	6 AM	7 & 8 AM	9 AM	10 AM & 11 AM	12 PM and 1 PM	2 PM	3 PM	4 & 5 PM	6 PM	7 PM	8 PM	12 PM to 4 AM	Daily
Average Toll Paid Per Mile (2021$)														
Northbound	$0.25	$0.63	$0.78	$0.51	$0.25	$0.33	$0.63	$0.89	$1.55	$1.55	$0.59	$0.21	$0.21	$0.77
Southbound	$0.25	$0.59	$0.96	$0.86	$0.35	$0.33	$0.35	$0.60	$0.78	$0.67	$0.25	$0.21	$0.21	$0.58
Average Toll Paid (2021$)														
Northbound	$1.62	$4.14	$4.65	$3.03	$1.74	$2.21	$4.15	$6.01	$11.05	$11.18	$4.19	$1.45	$0.46	$5.21
Southbound	$2.16	$4.51	$6.82	$5.93	$2.55	$2.22	$2.20	$3.76	$5.19	$4.47	$1.76	$1.02	$0.75	$4.04
Average Trip Length														
Northbound	6.57	6.51	5.99	5.98	7.02	6.77	6.61	6.75	7.14	7.24	7.16	6.74	2.22	6.76
Southbound	8.72	7.62	7.12	6.86	7.34	6.84	6.25	6.26	6.62	6.65	7.15	4.96	3.65	6.96

*The statistics in this table include Gantry 1 which is assumed to be operated under Virginia toll policy in these model runs

*The configuration between GW Parkway and River Rd/MD 190 (corresponding to Gantry 1/101 in this table) are under discussion with Virginia as part of the Capital Beltway Accord. All configurations on Phase 1 South are subject to change during the predevelopment phase with the developer

*Gantry 1 is included in this table

EXAMPLE TOLL RATES TO SPECIFIC DESTINATIONS
2-AXLE ETC, 2025 MODEL YEAR IN 2021$
WITH SOFT CAP

FIGURE 20

The number of weekdays reached or exceeded was then split into the number of weekdays exceeded and the number of weekdays reached but not exceeded. The approach for this disaggregation was developed based on review of priced managed lane data and discussion with CDM Smith priced managed lane staff. A lookup function was utilized for this disaggregation based on priced managed lane volumes (in PCEphpl) at a given gantry and time period. Given that volumes greater than 1,600 PCEphpl or speeds less than 50 miles per hour are required to exceed the soft cap, gantries in specific time periods with relatively higher volumes (in PCEphpl) were assumed to have the thresholds required to exceed the soft cap more frequently over the course of a year.

Tables 10, 11, and 12 contain estimates of the resulting number of weekdays per year that the toll rate cap may be reached or exceeded, exceeded, and reached but not exceeded, respectively, on the Maryland I-495 and I-270 Phase 1 south using the preliminary toll rate assumptions. The soft toll rate cap was estimated to most likely be reached or exceeded during the PM peak hours (4 & 5 PM and 6 PM time periods) in the northbound direction. This includes gantries 1, 3, 19, 21, 22 and 23. Gantry 19 in the 4 & 5 PM time period was estimated to exceed the soft cap most frequently. Gantry 3 in the 6 PM time period was estimated to reach but not exceed the soft cap most frequently.

Table 10 – 2025 Estimated Number of Weekdays Per Year the Soft Cap Would be Reached or Exceeded*
At $1.50 (2021$) Soft Cap, 1600 PCEphpl or 50 Mile Per Hour Soft Cap Thresholds
$1.50 (2021$) Soft Cap in 2021 Escalated 2.1% Annually Equals $1.63 (2021$) Soft Cap in 2025

Roadway	Toll Gantry	Dist. (miles)	5 AM	6 AM	7 & 8 AM	9 AM	10 & 11 AM	12 & 1 PM	2 PM	3 PM	4 & 5 PM	6 PM	7 PM	8 PM to 12 AM	12 AM to 5 AM
MD I-495 IL (VA Toll Policy)	1	2.6	-	-	94	2	-	-	-	4	248	229	8	-	-
MD I-495 Outer Loop	101	2.6	-	-	-	2	-	-	-	11	54	11	-	-	-
MD I-495 Inner Loop	3	3.2	-	-	4	-	-	-	-	-	32	220	8	-	-
MD I-495 Outer Loop	103	3.2	-	-	-	-	-	-	-	5	62	8	-	-	-
MD I-495 IL / I-270 W Spur NB	19	2.7	-	-	-	-	-	-	-	-	230	170	-	-	-
MD I-495 OL / I-270 W Spur SB	119	2.7	-	-	-	2	-	-	-	-	19	5	-	-	-
I-270 E Spur NB	20	1.9	-	-	-	-	-	-	-	-	-	3	-	-	-
I-270 E Spur SB	120	1.9	-	-	-	2	-	-	-	-	-	-	-	-	-
I-270 Northbound	21	3	-	-	-	-	-	-	-	-	82	76	-	-	-
I-270 Southbound	121	3	-	-	-	4	-	-	-	-	-	-	-	-	-
I-270 Northbound	22	2.8	-	-	-	-	-	-	-	-	66	76	-	-	-
I-270 Southbound	122	2.8	-	-	6	10	-	-	-	-	-	-	-	-	-
I-270 Northbound	23	1.8	-	-	-	-	-	-	-	-	82	102	-	-	-
I-270 Southbound	123	1.8	-	-	13	10	-	-	-	-	-	-	-	-	-

*The configuration between GW Parkway and River Rd/MD 190 (corresponding to Gantry 1/101 in this table) are under discussion with Virginia as part of the Capital Beltway Accord. In this specific model run, Gantry 1 was assumed to have Virginia toll policy, so the soft cap would not apply to Gantry 1. If the gantry was assumed to have Maryland toll policy the rates would be similar. The estimates in this table for Gantry 1 are thus an approximation of the soft cap impacts were Maryland toll policy to be applied to Gantry 1.
*All configurations on Phase 1 South are subject to change during the predevelopment phase with the developer.

Table 11 – 2025 Estimated Number of Weekdays Per Year the Soft Cap Would be Exceeded*
At $1.50 (2021$) Soft Cap, 1600 PCEphpl or 50 Mile Per Hour Soft Cap Thresholds
$1.50 (2021$) Soft Cap in 2021 Escalated 2.1% Annually Equals $1.63 (2021$) Soft Cap in 2025

Roadway	Toll Gantry	Dist. (miles)	5 AM	6 AM	7 & 8 AM	9 AM	10 & 11 AM	12 & 1 PM	2 PM	3 PM	4 & 5 PM	6 PM	7 PM	8 PM to 12 AM	12 AM to 5 AM
MD I-495 IL (VA Toll Policy)	1	2.6	-	-	34	1	-	-	-	2	168	155	4	-	-
MD I-495 Outer Loop	101	2.6	-	-	-	1	-	-	-	5	32	5	-	-	-
MD I-495 Inner Loop	3	3.2	-	-	0	-	-	-	-	-	3	34	1	-	-
MD I-495 Outer Loop	103	3.2	-	-	-	-	-	-	-	1	11	1	-	-	-
MD I-495 IL / I-270 W Spur NB	19	2.7	-	-	-	-	-	-	-	-	156	85	-	-	-
MD I-495 OL / I-270 W Spur SB	119	2.7	-	-	-	1	-	-	-	-	5	1	-	-	-
I-270 E Spur NB	20	1.9	-	-	-	-	-	-	-	-	-	0	-	-	-
I-270 E Spur SB	120	1.9	-	-	-	0	-	-	-	-	-	-	-	-	-
I-270 Northbound	21	3	-	-	-	-	-	-	-	-	34	29	-	-	-
I-270 Southbound	121	3	-	-	-	1	-	-	-	-	-	-	-	-	-
I-270 Northbound	22	2.8	-	-	-	-	-	-	-	-	39	49	-	-	-
I-270 Southbound	122	2.8	-	-	4	6	-	-	-	-	-	-	-	-	-
I-270 Northbound	23	1.8	-	-	-	-	-	-	-	-	53	72	-	-	-
I-270 Southbound	123	1.8	-	-	9	6	-	-	-	-	-	-	-	-	-

*The configuration between GW Parkway and River Rd/MD 190 (corresponding to Gantry 1/101 in this table) are under discussion with Virginia as part of the Capital Beltway Accord. In this specific model run, Gantry 1 was assumed to have Virginia toll policy, so the soft cap would not apply to Gantry 1. If the gantry was assumed to have Maryland toll policy the rates would be similar. The estimates in this table for Gantry 1 are thus an approximation of the soft cap impacts were Maryland toll policy to be applied to Gantry 1.
*All configurations on Phase 1 South are subject to change during the predevelopment phase with the developer.

Table 12 – 2025 Estimated Number of Weekdays Per Year the Soft Cap Would be Reached but not Exceeded*
At $1.50 (2021$) Soft Cap, 1600 PCEphpl or 50 Mile Per Hour Soft Cap Thresholds
$1.50 (2021$) Soft Cap in 2021 Escalated 2.1% Annually Equals $1.63 (2021$) Soft Cap in 2025

Roadway	Toll Gantry	Dist. (miles)	5 AM	6 AM	7 & 8 AM	9 AM	10 & 11 AM	12 & 1 PM	2 PM	3 PM	4 & 5 PM	6 PM	7 PM	8 PM to 12 AM	12 AM to 5 AM
MD I-495 IL (VA Toll Policy)	1	2.6	-	-	60	1	-	-	-	2	80	74	4	-	-
MD I-495 Outer Loop	101	2.6	-	-	-	1	-	-	-	6	22	6	-	-	-
MD I-495 Inner Loop	3	3.2	-	-	4	-	-	-	-	-	29	186	7	-	-
MD I-495 Outer Loop	103	3.2	-	-	-	-	-	-	-	4	51	7	-	-	-
MD I-495 IL / I-270 W Spur NB	19	2.7	-	-	-	-	-	-	-	-	74	85	-	-	-
MD I-495 OL / I-270 W Spur SB	119	2.7	-	-	-	1	-	-	-	-	14	4	-	-	-
I-270 E Spur NB	20	1.9	-	-	-	-	-	-	-	-	-	3	-	-	-
I-270 E Spur SB	120	1.9	-	-	-	2	-	-	-	-	-	-	-	-	-
I-270 Northbound	21	3	-	-	-	-	-	-	-	-	48	47	-	-	-
I-270 Southbound	121	3	-	-	-	3	-	-	-	-	-	-	-	-	-
I-270 Northbound	22	2.8	-	-	-	-	-	-	-	-	27	27	-	-	-
I-270 Southbound	122	2.8	-	-	2	4	-	-	-	-	-	-	-	-	-
I-270 Northbound	23	1.8	-	-	-	-	-	-	-	-	29	30	-	-	-
I-270 Southbound	123	1.8	-	-	4	4	-	-	-	-	-	-	-	-	-

*The configuration between GW Parkway and River Rd/MD 190 (corresponding to Gantry 1/101 in this table) are under discussion with Virginia as part of the Capital Beltway Accord. In this specific model run, Gantry 1 was assumed to have Virginia toll policy, so the soft cap would not apply to Gantry 1. If the gantry was assumed to have Maryland toll policy the rates would be similar. The estimates in this table for Gantry 1 are thus an approximation of the soft cap impacts were Maryland toll policy to be applied to Gantry 1.
*All configurations on Phase 1 South are subject to change during the predevelopment phase with the developer.

7.Escalation Factors

Escalation factors were assumed as part of the preliminary maximum toll rates and the preliminary soft cap toll rates to allow for these rates to be increased in the future. The preliminary escalation formula is:

$$Rate_x = Rate_{2021} * (1 + 1.1\% + 1.0\%)^{(x - 2021)} * CPI_x / CPI_{2021}$$

Where:

$Rate_x$ = soft rate cap in year x

$Rate_{2021}$ = soft rate cap established in the 2021 toll setting

CPI_x = consumer price index (CPI-U Washington Metro for all items, designated by the US Bureau of Labor Statistics under the code CUURS35ASA0) in January of year x

CPI_{2021} = consumer price index in January 2021

Escalation for the preliminary maximum and soft cap toll rates was made up of two sets of factors, an inflation-based escalation factor ("CPI_x / CPI_{2021}" part of the formula) and a "real growth" escalation factor ("1.1% = 1.0%" part of the formula). (Note that the preliminary minimum toll rates which are not discussed in this report only consider inflation-based escalation factors.) The inflation-based escalation factor was assumed to account for underlying changes in the relative purchasing value of money over time. The inflation factor is tied to the future consumer price index for Washington Metro.

The total "real growth" escalation factor of 2.1 percent (1.1% + 1.0%) was assumed to account for demand growth for the I-495 and I-270 Priced Managed Lanes over time. Because the supply (number of lanes) for the managed lanes is fixed over time, many factors including anticipated growth in regional population, employment, and real incomes above inflation are anticipated to increase the traffic demand for using the project over time. This is anticipated to lead to higher toll rates (in real dollar terms) needing to be charged to manage demand on the facility in the future. The real growth escalation factor was estimated by reviewing estimated growth in toll rates over time from the model results in combination with historical socioeconomic growth trends for the project region. Considering the model results, as described previously in the Maximum Toll Rates Section of this report the maximum average passenger car ETC toll rate from the 2025 model year was $2.25 per mile (in 2019$) in the 6 to 7 PM model time period. Considering the 2045 model year in the same time period, this rate was estimated to increase to $3.40 (in 2019$). The estimated annual average real growth between these two toll rates is 2.1 percent. This 2.1 percent annual real growth can be thought of as partially driven by population and employment growth (the 1.1% in the formula) and real income growth above inflation (the 1.0% in the formula). As a point of comparison, the 2005 to 2019 average population, employment, and per capita real income growth rates for the Washington Suburban region of Maryland (Frederick, Montgomery, and Price George's Counties) were 0.8 percent, 1.2 percent, and 1.0 percent, respectively.

8.Estimated 2021 Toll Rates

This section includes average toll rates for a 2021 model year in 2021$. These were estimated to allow for more direct comparison with the soft cap and maximum toll rates which will be presented to the board for year 2021 in 2021$. The 2021 model year inputs were developed by interpolating the inputs to CDM Smith's base year 2017 and future year 2025 models.

8.1 Average 2021 Toll Rates

Tables 13, 14, and 15 show similar average toll results as presented previously in **Tables 1, 2, and 3** and **Tables 7, 8, and 9** but for the 2021 model year and including soft caps. Similar to **Tables 7, 8, and 9,** these 2021 results assume that that Virginia toll policies would apply to Gantry 1. As identified in **Table 13** in red font, the assumed $1.50 soft cap (2021 in 2021$) is estimated to be reached during average conditions at Gantry 3 during the 6 PM time period and at Gantry 19 during the 4 to 5 PM time period. Two examples of how the toll rate signs may look to drivers are provided in **Figure 21**.

8.2 2021 Soft Cap Frequency Estimates

Other gantries and time periods would also be expected to reach or exceed the soft cap during non-average conditions. An estimate of the frequency of this occurring at all gantries during all time periods was made using a post-model analysis process. This process is described previously in Section 6.2.

Tables 16, 17, and 18 contain estimates of the resulting number of weekdays per year that the toll rate cap may be reached or exceeded, exceeded, and reached but not exceeded, respectively, on the Maryland I-495 and I-270 Phase 1 south using the preliminary toll rate assumptions for 2021. The soft toll rate cap was estimated to most likely be reached or exceeded during the PM peak hours (4 & 5 PM and 6 PM time periods) in the northbound direction. This includes gantries 1, 3, 19, 21, 22 and 23. Gantry 19 in the 4 & 5 PM time period was estimated to exceed the soft cap most frequently. Gantry 3 in the 6 PM time period was estimated to reach but not exceed the soft cap most frequently

Table 13 – 2021 Estimated Weekday Average Per Mile Toll Rates per Gantry in 2021$*
Passenger Car ETC, Phase 1 South
At $1.50 (2021$) Soft Cap, 1600 PCEphpl or 50 Mile Per Hour Soft Cap Thresholds
Rates in Red were Estimated to Reach or Exceed the Soft Cap

Roadway	Toll Gantry	Dist. (miles)	5 AM	6 AM	7 & 8 AM	9 AM	10 AM & 11 AM	12 PM and 1 PM	2 PM	3 PM	4 & 5 PM	6 PM	7 PM	8 PM	12 PM to 4 AM
MD I-495 IL (VA Toll Policy)	1	2.6	$0.21	$0.77	$1.24	$0.77	$0.36	$0.36	$0.83	$0.98	$2.06	$2.01	$0.67	$0.21	$0.21
MD I-495 Outer Loop	101	2.6	$0.36	$0.67	$0.62	$0.72	$0.36	$0.36	$0.36	$0.72	$1.14	$0.67	$0.31	$0.21	$0.21
MD I-495 Inner Loop	3	3.2	$0.31	$0.77	$0.98	$0.57	$0.36	$0.36	$0.83	$1.03	$1.39	$1.50	$0.62	$0.26	$0.21
MD I-495 Outer Loop	103	3.2	$0.36	$0.52	$0.57	$0.67	$0.36	$0.31	$0.52	$0.77	$1.14	$0.77	$0.21	$0.21	$0.21
MD I-495 IL / I-270 W Spur NB	19	2.7	$0.21	$0.52	$0.72	$0.41	$0.21	$0.31	$0.57	$0.77	$1.50	$1.39	$0.46	$0.21	$0.21
MD I-495 OL / I-270 W Spur SB	119	2.7	$0.31	$0.62	$0.83	$0.77	$0.36	$0.36	$0.36	$0.52	$0.93	$0.62	$0.21	$0.21	$0.21
I-270 E Spur NB	20	1.9	$0.21	$0.21	$0.21	$0.21	$0.21	$0.21	$0.31	$0.36	$0.62	$0.72	$0.46	$0.21	$0.21
I-270 E Spur SB	120	1.9	$0.21	$0.46	$0.83	$0.77	$0.26	$0.21	$0.21	$0.21	$0.31	$0.21	$0.21	$0.21	$0.21
I-270 Northbound	21	3	$0.21	$0.36	$0.36	$0.36	$0.21	$0.31	$0.46	$0.67	$1.29	$1.24	$0.46	$0.21	$0.21
I-270 Southbound	121	3	$0.21	$0.52	$0.88	$0.83	$0.36	$0.31	$0.26	$0.36	$0.46	$0.41	$0.21	$0.21	$0.21
I-270 Northbound	22	2.8	$0.21	$0.31	$0.31	$0.36	$0.21	$0.36	$0.41	$0.62	$1.24	$1.24	$0.52	$0.21	$0.21
I-270 Southbound	122	2.8	$0.21	$0.57	$1.03	$0.98	$0.36	$0.36	$0.21	$0.26	$0.36	$0.36	$0.21	$0.21	$0.21
I-270 Northbound	23	1.8	$0.21	$0.21	$0.36	$0.36	$0.21	$0.36	$0.52	$0.72	$1.24	$1.34	$0.57	$0.21	$0.21
I-270 Southbound	123	1.8	$0.21	$0.57	$1.08	$0.98	$0.36	$0.36	$0.21	$0.21	$0.36	$0.36	$0.21	$0.21	$0.21
Full Length Northbound	**1,2,19,21,22,23**	**12.9**	**$0.21**	**$0.44**	**$0.60**	**$0.46**	**$0.24**	**$0.34**	**$0.56**	**$0.75**	**$1.47**	**$1.44**	**$0.53**	**$0.21**	**$0.21**
Full Length Southbound	**101,102,119,121,122,123**	**12.9**	**$0.26**	**$0.59**	**$0.88**	**$0.85**	**$0.36**	**$0.35**	**$0.28**	**$0.42**	**$0.66**	**$0.49**	**$0.23**	**$0.21**	**$0.21**

*The configuration between GW Parkway and River Rd/MD 190 (corresponding to Gantry 1/101 in this table) are under discussion with Virginia as part of the Capital Beltway Accord. All configurations on Phase 1 South are subject to change during the predevelopment phase with the developer

Table 14 – 2021 Estimated Weekday Average Toll Rates per Gantry in 2021$*
Passenger Car ETC, Phase 1 South
At $1.50 (2021$) Soft Cap, 1600 PCEphpl or 50 Mile Per Hour Soft Cap Thresholds

Roadway	Toll Gantry	Dist. (miles)	5 AM	6 AM	7 & 8 AM	9 AM	10 AM & 11 AM	12 PM and 1 PM	2 PM	3 PM	4 & 5 PM	6 PM	7 PM	8 PM	12 PM to 4 AM
MD I-495 IL (VA Toll Policy)	1	2.6	$0.54	$2.01	$3.22	$2.01	$0.94	$0.94	$2.15	$2.55	$5.37	$5.23	$1.74	$0.54	$0.54
MD I-495 Outer Loop	101	2.6	$0.94	$1.74	$1.61	$1.88	$0.94	$0.94	$0.94	$1.88	$2.95	$1.74	$0.81	$0.54	$0.54
MD I-495 Inner Loop	3	3.2	$0.99	$2.48	$3.14	$1.82	$1.16	$1.16	$2.64	$3.30	$4.46	$4.80	$1.98	$0.83	$0.66
MD I-495 Outer Loop	103	3.2	$1.16	$1.65	$1.82	$2.15	$1.16	$0.99	$1.65	$2.48	$3.63	$2.48	$0.66	$0.66	$0.66
MD I-495 IL / I-270 W Spur NB	19	2.7	$0.56	$1.39	$1.95	$1.11	$0.56	$0.84	$1.53	$2.09	$4.05	$3.76	$1.25	$0.56	$0.56
MD I-495 OL / I-270 W Spur SB	119	2.7	$0.84	$1.67	$2.23	$2.09	$0.98	$0.98	$0.98	$1.39	$2.51	$1.67	$0.56	$0.56	$0.56
I-270 E Spur NB	20	1.9	$0.39	$0.39	$0.39	$0.39	$0.39	$0.39	$0.59	$0.69	$1.18	$1.37	$0.88	$0.39	$0.39
I-270 E Spur SB	120	1.9	$0.39	$0.88	$1.57	$1.47	$0.49	$0.39	$0.39	$0.39	$0.59	$0.39	$0.39	$0.39	$0.39
I-270 Northbound	21	3	$0.62	$1.08	$1.08	$1.08	$0.62	$0.93	$1.39	$2.01	$3.87	$3.72	$1.39	$0.62	$0.62
I-270 Southbound	121	3	$0.62	$1.55	$2.63	$2.48	$1.08	$0.93	$0.77	$1.08	$1.39	$1.24	$0.62	$0.62	$0.62
I-270 Northbound	22	2.8	$0.58	$0.87	$0.87	$1.01	$0.58	$1.01	$1.16	$1.73	$3.47	$3.47	$1.45	$0.58	$0.58
I-270 Southbound	122	2.8	$0.58	$1.59	$2.89	$2.75	$1.01	$1.01	$0.58	$0.72	$1.01	$1.01	$0.58	$0.58	$0.58
I-270 Northbound	23	1.8	$0.37	$0.37	$0.65	$0.65	$0.37	$0.65	$0.93	$1.30	$2.23	$2.42	$1.02	$0.37	$0.37
I-270 Southbound	123	1.8	$0.37	$1.02	$1.95	$1.77	$0.65	$0.65	$0.37	$0.37	$0.65	$0.65	$0.37	$0.37	$0.37
Full Length Northbound	**1,2,19,21,22,23**	**12.9**	**$2.66**	**$5.73**	**$7.77**	**$5.87**	**$3.07**	**$4.37**	**$7.16**	**$9.69**	**$18.99**	**$18.60**	**$6.86**	**$2.66**	**$2.66**
Full Length Southbound	**101,102,119,121,122,123**	**12.9**	**$3.34**	**$7.58**	**$11.32**	**$10.96**	**$4.66**	**$4.51**	**$3.64**	**$5.45**	**$8.52**	**$6.32**	**$2.93**	**$2.66**	**$2.66**

*The configuration between GW Parkway and River Rd/MD 190 (corresponding to Gantry 1/101 in this table) are under discussion with Virginia as part of the Capital Beltway Accord. All configurations on Phase 1 South are subject to change during the predevelopment phase with the developer

Table 15 – 2021 Estimated Weekday Average Toll Rates Per Trip in 2021$*
Passenger Car ETC, Phase 1 South
At $1.50 (2021$) Soft Cap, 1600 PCEphpl or 50 Mile Per Hour Soft Cap Thresholds

Direction	5 AM	6 AM	7 & 8 AM	9 AM	10 AM & 11 AM	12 PM and 1 PM	2 PM	3 PM	4 & 5 PM	6 PM	7 PM	8 PM	12 PM to 4 AM	Daily
Average Toll Paid Per Mile (2021$)														
Northbound	$0.21	$0.51	$0.60	$0.45	$0.23	$0.31	$0.53	$0.70	$1.33	$1.31	$0.49	$0.21	$0.21	$0.66
Southbound	$0.24	$0.52	$0.78	$0.77	$0.33	$0.31	$0.29	$0.45	$0.69	$0.51	$0.21	$0.21	$0.21	$0.50
Total	$0.24	$0.52	$0.72	$0.64	$0.28	$0.31	$0.41	$0.60	$1.08	$1.01	$0.41	$0.21	$0.21	$0.58
Average Toll Paid (2021$)														
Northbound	$1.29	$3.43	$3.51	$2.62	$1.57	$2.09	$3.51	$4.66	$9.41	$9.30	$3.47	$1.25	$0.44	$4.42
Southbound	$2.13	$3.95	$5.36	$5.20	$2.41	$2.11	$1.77	$2.77	$4.53	$3.35	$1.50	$0.94	$0.74	$3.44
Total	$1.97	$3.81	$4.62	$4.06	$2.00	$2.10	$2.66	$3.84	$7.38	$6.99	$2.86	$1.20	$0.62	$3.95
Average Trip Length														
Northbound	6.25	6.73	5.81	5.80	6.87	6.82	6.61	6.63	7.05	7.08	7.02	6.04	2.15	6.66
Southbound	8.76	7.62	6.87	6.79	7.33	6.84	6.19	6.20	6.57	6.63	7.09	4.54	3.60	6.89
Total	8.30	7.39	6.45	6.35	7.11	6.83	6.41	6.44	6.85	6.91	7.04	5.81	3.00	6.77

*The statistics in this table include Gantry 1 which is assumed to be operated under Virginia toll policy in these model runs

*The configuration between GW Parkway and River Rd/MD 190 (corresponding to Gantry 1/101 in this table) are under discussion with Virginia as part of the Capital Beltway Accord. All configurations on Phase 1 South are subject to change during the predevelopment phase with the developer

Toll Rate Setting Report   I-495 and I-270 Priced Managed Lanes Traffic and Revenue Study

Example Off Peak Conditions:
10 and 11 AM Southbound

495 270 SOUTH

GUDE DR	$0.65
495 N. BELT	$3.24
VIRGINIA	$4.66

Toll Gantry	Distance (miles)	Gude Dr	495 N. Belt.	Virginia	Per Mile Toll
23	1.8	$ 0.65	$ 0.65	$ 0.65	$ 0.36
22	2.8		$ 1.01	$ 1.01	$ 0.36
21	3.0		$ 1.08	$ 1.08	$ 0.36
20	1.9		$ 0.49		$ 0.26
19	2.7			$ 0.98	$ 0.36
3	3.2				-
1	2.6			$ 0.94	$ 0.36
Total	12.9	$ 0.65	$ 3.24	$ 4.66	
Per Mile		$ 0.36	$ 0.34	$ 0.36	
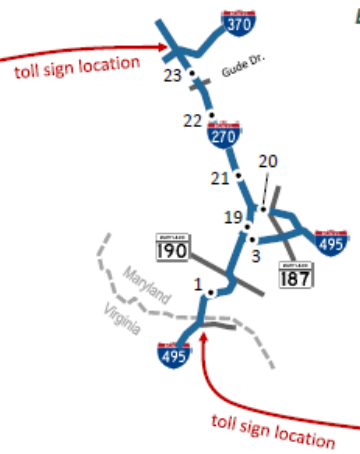
Example Peak Hour/Heavy Congestion:
6PM Northbound

Toll Gantry	Distance (miles)	MD 190	MD 187	I-370	Per Mile Toll
1	2.6	$ 5.23	$ 5.23	$ 5.23	$ 2.01
3	3.2		$ 4.80		$ 1.50
19	2.7			$ 3.76	$ 1.39
20	1.9				$ -
21	3.0			$ 3.72	$ 1.24
22	2.8			$ 3.47	$ 1.24
23	1.8			$ 2.42	$ 1.34
Total	12.9	$ 5.23	$ 10.03	$ 18.60	
Per Mile		$ 2.01	$ 1.73	$ 1.44	

toll sign location

495 270 NORTH

MD 190	$5.23
MD 187	$10.03
I-370	$18.60

toll sign location

Overall Notes:
1. Gantry 1 in the northbound direction was assumed to have Virginia toll policy
2. Gantry and access configurations on Phase 1 South are subject to change during the predevelopment phase with the developer
3. Gantry and access configurations between the GW Parkway and MD 190/River Rd. interchanges are subject to change based on the ongoing Maryland-Virginia Bi-State Border Agreement discussions.

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EXAMPLE TOLL RATES TO SPECIFIC DESTINATIONS
2-AXLE ETC, 2021 MODEL YEAR IN 2021$
WITH SOFT CAP

FIGURE 21

Table 16 – 2021 Estimated Number of Weekdays Per Year the Soft Cap Would be Reached or Exceeded*
At $1.50 (2021$) Soft Cap, 1600 PCEphpl or 50 Mile Per Hour Soft Cap Thresholds

Roadway	Toll Gantry	Dist. (miles)	5 AM	6 AM	7 & 8 AM	9 AM	10 & 11 AM	12 & 1 PM	2 PM	3 PM	4 & 5 PM	6 PM	7 PM	8 PM to 12 AM	12 AM to 5 AM
MD I-495 IL (VA Toll Policy)	1	2.6	-	-	5	-	-	-	-	-	246	221	4	-	-
MD I-495 Outer Loop	101	2.6	-	-	-	-	-	-	-	-	45	-	-	-	-
MD I-495 Inner Loop	3	3.2	-	-	2	-	-	-	-	-	70	190	3	-	-
MD I-495 Outer Loop	103	3.2	-	-	-	-	-	-	-	-	45	3	-	-	-
MD I-495 IL / I-270 W Spur NB	19	2.7	-	-	-	-	-	-	-	-	223	79	-	-	-
MD I-495 OL / I-270 W Spur SB	119	2.7	-	-	-	-	-	-	-	-	11	-	-	-	-
I-270 E Spur NB	20	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-
I-270 E Spur SB	120	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-
I-270 Northbound	21	3	-	-	-	-	-	-	-	-	33	42	-	-	-
I-270 Southbound	121	3	-	-	-	3	-	-	-	-	-	-	-	-	-
I-270 Northbound	22	2.8	-	-	-	-	-	-	-	-	27	42	-	-	-
I-270 Southbound	122	2.8	-	-	3	9	-	-	-	-	-	-	-	-	-
I-270 Northbound	23	1.8	-	-	-	-	-	-	-	-	27	67	2	-	-
I-270 Southbound	123	1.8	-	-	4	9	-	-	-	-	-	-	-	-	-

*The configuration between GW Parkway and River Rd/MD 190 (corresponding to Gantry 1/101 in this table) are under discussion with Virginia as part of the Capital Beltway Accord. In this specific model run, Gantry 1 was assumed to have Virginia toll policy, so the soft cap would not apply to Gantry 1. If the gantry was assumed to have Maryland toll policy the rates would be similar. The estimates in this table for Gantry 1 are thus an approximation of the soft cap impacts were Maryland toll policy to be applied to Gantry 1.
*All configurations on Phase 1 South are subject to change during the predevelopment phase with the developer.

Table 17 – 2021 Estimated Number of Weekdays Per Year the Soft Cap Would be Exceeded*
At $1.50 (2021$) Soft Cap, 1600 PCEphpl or 50 Mile Per Hour Soft Cap Thresholds

Roadway	Toll Gantry	Dist. (miles)	5 AM	6 AM	7 & 8 AM	9 AM	10 & 11 AM	12 & 1 PM	2 PM	3 PM	4 & 5 PM	6 PM	7 PM	8 PM to 12 AM	12 AM to 5 AM
MD I-495 IL (VA Toll Policy)	1	2.6	-	-	2	-	-	-	-	-	166	149	2	-	-
MD I-495 Outer Loop	101	2.6	-	-	-	-	-	-	-	-	27	-	-	-	-
MD I-495 Inner Loop	3	3.2	-	-	0	-	-	-	-	-	7	30	0	-	-
MD I-495 Outer Loop	103	3.2	-	-	-	-	-	-	-	-	8	0	-	-	-
MD I-495 IL / I-270 W Spur NB	19	2.7	-	-	-	-	-	-	-	-	151	40	-	-	-
MD I-495 OL / I-270 W Spur SB	119	2.7	-	-	-	-	-	-	-	-	3	-	-	-	-
I-270 E Spur NB	20	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-
I-270 E Spur SB	120	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-
I-270 Northbound	21	3	-	-	-	-	-	-	-	-	14	16	-	-	-
I-270 Southbound	121	3	-	-	-	1	-	-	-	-	-	-	-	-	-
I-270 Northbound	22	2.8	-	-	-	-	-	-	-	-	16	27	-	-	-
I-270 Southbound	122	2.8	-	-	2	5	-	-	-	-	-	-	-	-	-
I-270 Northbound	23	1.8	-	-	-	-	-	-	-	-	17	47	1	-	-
I-270 Southbound	123	1.8	-	-	3	5	-	-	-	-	-	-	-	-	-

*The configuration between GW Parkway and River Rd/MD 190 (corresponding to Gantry 1/101 in this table) are under discussion with Virginia as part of the Capital Beltway Accord. In this specific model run, Gantry 1 was assumed to have Virginia toll policy, so the soft cap would not apply to Gantry 1. If the gantry was assumed to have Maryland toll policy the rates would be similar. The estimates in this table for Gantry 1 are thus an approximation of the soft cap impacts were Maryland toll policy to be applied to Gantry 1.

*All configurations on Phase 1 South are subject to change during the predevelopment phase with the developer.

Table 18 – 2021 Estimated Number of Weekdays Per Year the Soft Cap Would be Reached but not Exceeded*
At $1.50 (2021$) Soft Cap, 1600 PCEphpl or 50 Mile Per Hour Soft Cap Thresholds

Roadway	Toll Gantry	Dist. (miles)	5 AM	6 AM	7 & 8 AM	9 AM	10 & 11 AM	12 & 1 PM	2 PM	3 PM	4 & 5 PM	6 PM	7 PM	8 PM to 12 AM	12 AM to 5 AM
MD I-495 IL (VA Toll Policy)	1	2.6	-	-	3	-	-	-	-	-	80	72	2	-	-
MD I-495 Outer Loop	101	2.6	-	-	-	-	-	-	-	-	18	-	-	-	-
MD I-495 Inner Loop	3	3.2	-	-	2	-	-	-	-	-	63	161	3	-	-
MD I-495 Outer Loop	103	3.2	-	-	-	-	-	-	-	-	37	3	-	-	-
MD I-495 IL / I-270 W Spur NB	19	2.7	-	-	-	-	-	-	-	-	72	39	-	-	-
MD I-495 OL / I-270 W Spur SB	119	2.7	-	-	-	-	-	-	-	-	8	-	-	-	-
I-270 E Spur NB	20	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-
I-270 E Spur SB	120	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-
I-270 Northbound	21	3	-	-	-	-	-	-	-	-	19	26	-	-	-
I-270 Southbound	121	3	-	-	-	2	-	-	-	-	-	-	-	-	-
I-270 Northbound	22	2.8	-	-	-	-	-	-	-	-	11	15	-	-	-
I-270 Southbound	122	2.8	-	-	1	4	-	-	-	-	-	-	-	-	-
I-270 Northbound	23	1.8	-	-	-	-	-	-	-	-	10	20	1	-	-
I-270 Southbound	123	1.8	-	-	1	4	-	-	-	-	-	-	-	-	-

*The configuration between GW Parkway and River Rd/MD 190 (corresponding to Gantry 1/101 in this table) are under discussion with Virginia as part of the Capital Beltway Accord. In this specific model run, Gantry 1 was assumed to have Virginia toll policy, so the soft cap would not apply to Gantry 1. If the gantry was assumed to have Maryland toll policy the rates would be similar. The estimates in this table for Gantry 1 are thus an approximation of the soft cap impacts were Maryland toll policy to be applied to Gantry 1.

*All configurations on Phase 1 South are subject to change during the predevelopment phase with the developer.

Disclaimer

CDM Smith used currently-accepted professional practices and procedures in the development of the traffic and revenue estimates in this report. However, as with any forecast, it should be understood that differences between forecasted and actual results may occur, as caused by events and circumstances beyond the control of the forecasters. In formulating the estimates, CDM Smith reasonably relied upon the accuracy and completeness of information provided (both written and oral) by MDOT. CDM Smith also relied upon the reasonable assurances of independent parties and is not aware of any material facts that would make such information misleading.

CDM Smith made qualitative judgments related to several key variables in the development and analysis of the traffic and revenue estimates that must be considered as a whole; therefore, selecting portions of any individual result without consideration of the intent of the whole may create a misleading or incomplete view of the results and the underlying methodologies used to obtain the results. CDM Smith gives no opinion as to the value or merit of partial information extracted from this report.

All estimates and projections reported herein are based on CDM Smith's experience and judgment and on a review of information obtained from multiple agencies, including MDOT. These estimates and projections may not be indicative of actual or future values and are therefore subject to substantial uncertainty. Future developments and economic conditions cannot be predicted with certainty, and may affect the estimates or projections expressed in this report, such that CDM Smith does not specifically guarantee or warrant any estimate or projection contained within this report.

While CDM Smith believes that the projections and other forward-looking statements contained within the report are based on reasonable assumptions as of the date of the report, such forward-looking statements involve risks and uncertainties that may cause actual results to differ materially from the results predicted. Therefore, following the date of this report, CDM Smith will take no responsibility or assume any obligation to advise of changes that may affect its assumptions contained within the report, as they pertain to socioeconomic and demographic forecasts, proposed residential or commercial land use development projects and/or potential improvements to the regional transportation network.

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*   *   *

Do not hesitate to contact us should you require additional background information on the analysis presented in this report.

Very truly yours,

Ronald Davis, III
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